SOIL SURVEY OF NATCHITOCHES PARISH, LA.

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DESCRIPTION OF THE AREA.

Natchitoches Parish, La., is situated in the northwestern part of the State, in the valley of the Red River. It is irregular in shape, being about 54 miles long, north and south, and varying from 15 to 30 miles in width. It has an area of 1,265 square miles, or 809,600 acres.

The parish lies in the high, prevailingly rolling interior Gulf Coastal Plain region, which occupies northwestern Louisiana and the adjacent parts of Texas and Arkansas. The range of elevation is more than 300 feet. Through the northern and central parts of the parish the surface has generally been reduced below the constructional plain surface. The uplands generally rise gradually from the Red River and its main branches, with extensive developments of undulating or gently rolling country along the larger streams. In the southern part a belt of land about 10 miles wide is mainly occupied by the high, rugged hills known as the Kisatchie Hills or Kisatchie Wold, a belt of broken country extending east and west across this part of the State. It is especially deeply dissected and rugged in this parish, where the Red River flows along its base and the valley of Kisatchie Bayou cuts through it. The ridges are underlain by beds of solid sandstone and mudstone, and are deeply dissected by numerous short streams.[1]

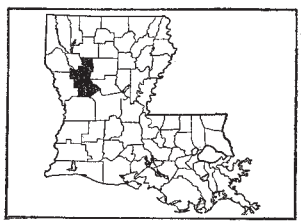

FIG. 46.—Sketch map showing location of the Natchitoches Parish area, Louisiana.

Red River flows through the parish from northwest to southeast, and is joined on the eastern boundary by two large streams from the north, Black Lake and Saline Bayous. The bottoms along the river are in most places 10 or 12 miles wide, and along the larger tributaries they are fairly wide; a little more than half the area of the parish consists of bottom land and stream terraces.

The uplands included between Saline and Black Lake Bayous stand well above the bottoms of the main stream and have a gradual rise to a high central divide. The drainage basin of Black Lake Bayou is predominantly of an undulating to gently rolling topography. On or near the divide there is a belt of flatwoods a mile or more in width. In the north the flatwoods belt is only slightly higher than the country to the west, but farther south it stands well

[1] Bul. No. 4, La. Geol. Survey; Geology and Underground Resources of Northern Louisiana, by A. C. Veatch.

above it and is rather deeply dissected by the heads of streams flowing west and south to Black Lake.

East of the flatwoods is a belt of sand hills. On the north this belt is high and cut by numerous steep-sided hollows. South of Strange

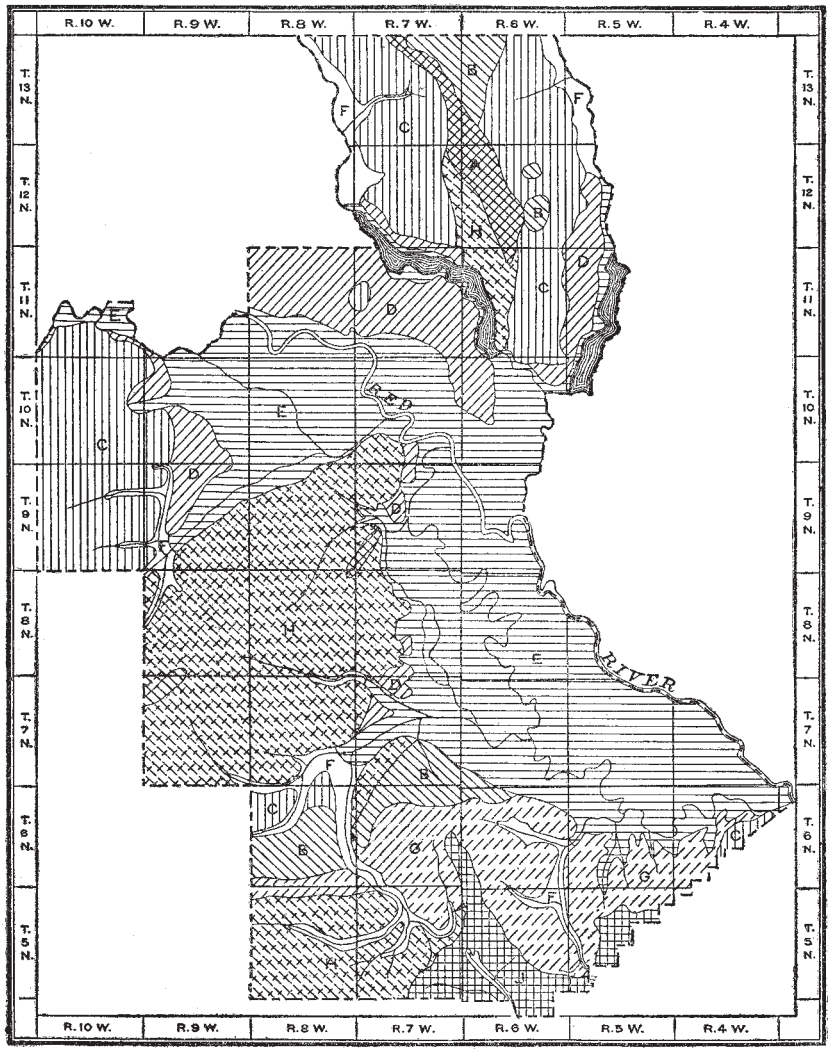

FIG. 47.—Principal physiographic provinces, Natchitoches Parish, La. (A, flatwoods, plastic clay; B, sand hills; C, gently rolling to rolling country; D, Red River terraces; E, Red River bottoms; F, bottoms and terraces of streams tributary to Red River; G, Kisatchie Hills; H, rolling to hilly country; J, flatwoods, mainly sandy loam soils.)

there are only small isolated sand-hill areas, which rise abruptly from a gently rolling highland. The uplands along Saline Bayou are usually gently rolling, but they stand well above the main stream bottoms, and in places the stream slopes are short and rather steep.

The uplands in the west-central part of the parish can only be generally classified as to topography, for, though the elevations are considerably lower than those in the southern part of the county, the surface is sloping, and there is a general irregularity in the course of the drainage divides and the depth and complexity of dissection.

The surface of the divide between the Red and Calcasieu Rivers and of that part of the Devils Creek basin lying within the parish is characteristically flat to undulating. The drainage ways over considerable areas are only slight depressions, and the drainage is imperfect.

Figure 47 shows the position of the various physiographic provinces of the county.

The city of Natchitoches was established as a trading post by the French in 1714. Spanish forces at about the same time established a post at Adayes, near the present site of Robeline. The Spanish settlements were small, but there are still a number of people of Spanish descent in this vicinity. Natchitoches became an important post. Navigation of the river above this place was obstructed by masses of lodged timber known as the Red River Rafts. Nearly all the river and bayou fronts were settled by French in the eighteenth century. After a period of Spanish sovereignty, 1801 to 1803, the territory again came under French rule, and was ceded to the United States in 1803.

Until comparatively recent times, farming was almost entirely restricted to the river bottoms. Nearly all these lands were owned in large plantations and farmed with negro labor. They are for the most part still held in large tracts and occupied by negro tenants, though in certain localities there are numerous small farms operated by white farmers. In many sections French is commonly spoken, as well as English. The uplands gave such low yields of cotton, in comparison with the rich river bottoms, that comparatively little land was cleared there in the earlier years. Under boll-weevil conditions the difference is not so great, and the acreage under cultivation in the uplands is increasing.

The population has doubled in the last 40 years, and the higher back lands and the better farm lands in the upland are now partly occupied. The upland farmers are mostly more recent white settlers, immigrating from neighboring States. These late arrivals generally own their farms.

Ever since cotton has become an important crop it has been the principal agricultural product of this parish. In most cases enough grain and hay is produced for home needs, although the total of feeds shipped in is still rather large. The parish has been quite prosperous, except during and immediately after the Civil War. It is stated that heavy floods, covering much or nearly all the Red River bottoms, ruined the crop in 1849, 1890, 1892, and 1908. These high floods rise slowly, however, as the overflow is from back water; consequently there is little loss of life or of stock. The Red River drains a large basin in the dry regions of Oklahoma and Texas, and the periodic rainy seasons there cause these exceptionally high and prolonged floods.

Lumbering and turpentine production have been important industries for years. A great deal of the forested upland and some low bottom land was held in large tracts, permanent settlement being postponed until the timber had been removed. Lumbering operations have been on a large scale, and the greater part of the land is now cut over. This land has been offered to settlers for some years. A few years ago small tracts of the better farm land could be purchased for $7.50 to $15 an acre. Recently this land has either been withdrawn from sale or held at increased prices, owing to the discovery of oil in neighboring parishes.

Natchitoches, the parish seat, has a population of 3,388. It is centrally located, is the most important trading and shipping point in the parish, and the seat of the State normal school. Campti, Robeline, Marthaville, and Cloutierville are trade centers with banking facilities. Large sawmills are located at Campti, Shamrock, Victoria, Montrose, Derry and Chopin.

The parish has good transportation facilities. The lines of the Texas & Pacific Railway and of the Louisiana Railway & Navigation Co. traverse the parish in the Red River bottoms. The main line of the Louisiana & Arkansas Railway serves the northern uplands. The southern part of the parish is served by a branch of the Texas & Pacific, connecting with the main line at Cypress and at Shreveport. The Louisiana & Northwest Railroad extends north from Natchitoches. At present the southern part of this road is not in operation. A small steamboat plies Cane River Lake. There is very little traffic on Red River.

The main country roads of the parish are good most of the year. Roads on the sandy front lands of the river bottoms are very good through winter and spring, but are somewhat heavy through the summer. Stretches in the stiff lands of the bottom are good in summer, but are at times impassable in winter. The main roads in the uplands are graded and well supplied with bridges and culverts. A large bond issue has been voted for grading these roads and surfacing the bad stretches with gravel.

CLIMATE.

The climate of the area is quite temperate; through the winter frost seldom occurs more than two or three days in succession. The mean winter temperature is 47.3° F. The mean temperature of summer is 80.4° F. Peach trees often bloom in February, and even then there are fair prospects of escaping killing frosts.

Spring opens the latter part of March. The average date of the last killing frost at Robeline is March 20, and of the first in fall, November 2. Corn is planted in the bottoms, when conditions are favorable, during the last days of February.

The average annual rainfall at Robeline is 45.51 inches. The lowest rainfall recorded, 30.02 inches, was sufficient for crop production on fertile and well-cultivated land. The production of cotton under boll-weevil conditions is larger in summers of less than normal rainfall. Periods of drought may occur in the summer and fall months, but seldom are so protracted as to cause material injury to well-cultivated crops.

The following table gives the more important climatic data, as recorded by the Weather Bureau station at Robeline:

Normal monthly, seasonal, and annual temperature and precipitation at Robeline.

[Elevation, 147 feet.]

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1907).	Total amount for the wettest year (1913).	Snow, average depth.
	°F.	°F.	°F.	Inches.	Inches.	Inches.	Inches.
December	46.6	85	12	3.87	1.34	3.75	0.1
January	47.0	88	10	2.32	.55	5.25	.5
February	48.3	89	6	4.63	2.45	5.88	.5
Winter	47.3	89	6	10.82	4.34	14.88	1.1
March	59.7	91	21	4.39	1.32	10.60	.0
April	64.6	92	26	4.69	2.86	11.00	.0
May	72.1	99	34	4.87	10.15	3.73	.0
Spring	65.5	99	21	13.95	14.33	24.73	.0
June	78.8	104	44	3.62	1.47	4.78	.0
July	81.1	107	53	4.63	3.00	1.80	.0
August	81.4	110	49	3.42	.44	4.91	.0
Summer	80.4	110	44	11.67	4.91	11.49	.0
September	75.6	103	32	2.85	1.51	15.90	.0
October	64.3	96	24	2.72	1.68	1.77	.0
November	56.3	95	15	3.50	3.25	2.32	T.
Fall	65.4	103	15	9.07	6.44	19.99	T.
Year	64.6	110	6	45.51	30.02	71.09	1.1

AGRICULTURE.

The growth of agriculture in Natchitoches Parish since 1880 is indicated by the statistics of population and farm lands given in the following table, compiled from the reports of the last five censuses:

Population and farm lands, as reported by the census in 1880, 1890, 1900, 1910, and 1920.

Year.	Population.	Number of farms.	Land in farms.		Improved land in farms.		Average size of farms.
			Per cent.	Acres.	Per cent.	Acres.	Acres.
1880	19,707	1,313	29.4	242,905	25.8	62,367	185
1890	25,836	2,018	32.3	266,376	36.3	95,460	132
1900	33,216	4,262	38.3	316,240	39.6	125,302	74.2
1910	33,923	4,917	33.7	277,810	45.9	127,842	56.5
1920	38,602	5,408	34.4	283,375	52.2	145,179	52.4

This table shows a slow but steady growth in population, in the number of farms, and in the area of improved land in farms. Only one-third of the land in the county, however, has yet been included in farms, and there has been a slight retrogression in this respect since 1900, although the included area at present is somewhat greater than in 1880.

Settlement is largely concentrated in the river bottoms, probably 75 per cent of the improved farm lands of the parish being located in these sections.

At present (1921) cotton is the main crop in the river bottoms. With the coming of the boll weevil cotton growing became precarious, but the growers have been able to adjust themselves to the new conditions to some extent, and by growing early varieties and practicing better cultural methods generally they produce the crop at a profit, though with reduced yields. Poisoning the weevil has not yet been generally introduced. Corn is produced on a considerable scale, though only for home use. Many farms still buy a part of the corn and hay needed to carry the work stock. Cowpeas are quite commonly planted with the corn. Small areas are kept in Bermuda grasses, other grasses, or alfalfa, for hay and pasture. Patches of sugar cane, sweet potatoes, and oats are grown on many farms.

In the uplands the agriculture consists of stock raising and general farming. Stock is run throughout the year on the open range, with little care or feed even in winter. Only small herds of cattle are kept, but many farmers have 100 to 500 hogs. The cattle and hogs are largely of native stock, but some show the admixture of blood of improved breeds. Animals on the range are raised at very little expense, but owing to losses from disease, accidents, and other causes, the rate of increase is not great. It would probably be profitable to make provision for winter feeding of range stock.

The production of grain and forage for winter feeding is an important part of the agriculture on the upland farms. Corn is grown on a large acreage, and cowpeas are quite commonly planted in the corn. A small acreage of cowpeas, velvet beans, or peanuts is planted for winter pasturage and to supply feed in the form of hay. Some oats are grown for the same purposes. Small pastures of Bermuda grass, lespedeza, carpet grass, white clover, and other native plants are common.

For the parish as a whole cotton is the leading cash crop, and a considerable acreage is grown on nearly every farm. Sweet potatoes are a cash crop in some sections, and near towns or lumber camps watermelons and garden truck are grown for local sale.

The following table shows the acreage and production of corn and cotton and the acreage of other important crops, as determined by the Federal census:

Acreage and production of corn and cotton and acreage of other important crops in 1879, 1889, 1899, 1909, and 1919.

Year.	Corn.		Cotton.		All tame or cultivated grasses.	Alfalfa.	Sugar cane.	Sweet potatoes.	Potatoes.	Cowpeas and beans.	Peanuts.
	Acres.	*Bushels.*	*Acres.*	*Bales.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
1879	17,871	151,545	26,784	15,320	65	-------	28	197	-------	-------	-------
1889	21,557	289,684	39,601	22,899	411	-------	221	438	37	-------	-------
1899	39,697	630,540	55,803	31,577	533	10	73	331	103	64	20
1909	42,348	641,286	43,020	14,464	2,934	1,481	700	898	359	360	736
1919	45,888	642,263	64,251	13,327	4,087	825	442	1,256	391	711	363

The average yield of cotton in the parish in 1879, 1889, and 1899 was a little more than a half bale per acre. This was very largely on

river-bottom lands. Since then the boll weevil has reduced the yield more or less every year. The rank growth of the cotton plant in the river bottoms gives conditions of shade and dampness favorable to the weevil. The lighter soils produce somewhat smaller growth, and in dry seasons the cotton is not badly infested. About three-fourths to seven-eighths of the bolls open early in the season, and even in the uplands picking is practically finished by November 1.

The averge yield of corn in the parish, as reported by the census, has been from 10 to 16 bushels. The low yield is due partly to continued production of corn and cotton, without cover crops or rotation with clovers and grasses. Better farm methods produce 40 to 60 bushels per acre in the river bottoms and 20 to 30 bushels on the upland soils. Corn is planted from March to late June. The earlier plantings give the larger yields.

Within the last few years associations for the commercial production of sweet potatoes have been formed, and modern storage houses have been built at Goldonna and Campti. The industry is expected to expand. The potatoes are kept through the winter and shipped to northern markets in the spring. The preferred varieties are Porto Rico and Nancy Hall. The average yield in the vicinity of Goldonna is said to be about 190 bushels per acre. Most of the farmers use no fertilizer; some use 100 to 300 pounds of varying mixtures of acid phosphate and cottonseed meal. Moderately deep, sandy upland and terrace soils with friable subsoils are considered the most suitable soils for good yields combined with good quality. The heavier, redder variations of the Orangeburg fine sandy loam are said to produce too large a potato. The plants are set out in May or June and the crop is harvested in October or early November. Sweet potatoes may follow an early crop of potatoes.

Alfalfa was first grown in the parish about 1900. It occupied an area of 1,481 acres in 1909 and 825 acres in 1919. The Red River bottoms are especially well adapted to this crop. The soils are naturally fertile and high in lime. The nitrogen-fixing bacteria seem to be everywhere present in the soils, as the river carries deposits from important alfalfa-growing districts. Nodules were observed on plants from fields not artificially inoculated, but it is possible that direct inoculation might hasten their development. The Miller clay and the deeper variations of the Yahola clay are especially well adapted to the crop. These soils are extensive and occur on most farms in the river bottoms. In late summer the plants, especially during a dry season, have shown a tendency to die out on soils having a very sandy subsoil.

Fall seeding of alfalfa gives the best results, as it insures good root development. The growth is rapid; seeding in the fall or even as late as February yields a first cutting of about a ton per acre in early May. Four or five cuttings are obtained each season, the first cutting being the heaviest. The largest total yields are obtained the second and third year after seeding. The crop chokes out any Bermuda grass, but about the third year the stand begins to thin out, and crab grass and crowfoot appear. About the fifth or sixth year the stand becomes thin. Apparently this is not due to disease, as breaking and reseeding gives good stands. The yield is generally

reported as averaging about 3 tons per acre per season. The crop increases the fertility of the land, and is grown on some farms in rotation on the sandier river bottoms largely for this reason.

Potatoes are grown in a small way. The total production in 1919 was 22,602 bushels. The early crop, planted in February, matures about the middle of May, when the land may be replanted to potatoes, sweet potatoes, cowpeas, or corn. Triumph is a commonly grown variety. The crop is not so productive as sweet potatoes, but with small amounts of mixed fertilizer, the yield on the better upland soils is said to be from 100 to 150 bushels per acre. The average yield appears to be much lower. In the adjoining parish of Rapides the crop is grown on a rather large scale, mostly on the Miller very fine sandy loam.

A small acreage of velvet beans is grown on many farms on the uplands and terraces. In favorable seasons the crop produces heavily on all the soils, especially on those recently cleared. Corn is planted in the crop to support the long vines. The corn is usually harvested, though the heavy tangled growth of vine makes it difficult. The bean crop is nearly always used for hog and cattle pasture, remaining palatable and nutritious in the field through the winter. Some farmers pick the beans by hand. A yield of 60 bushels of beans per acre may be obtained.

Sugar cane is grown in a small way on most farms, both in the upland and in the bottoms. The quality of sirup is best on the lighter soils and those with friable subsoils, and the soils with yellow subsoils are said to yield a clearer sirup. The "blue" sugar cane is most commonly planted, but some ribbon cane is grown. Two crops are generally produced from one setting, the second, or rattoon crop, giving somewhat lower yields. In the adjoining parish of Rapides the crop is produced extensively on the sandy and silty soils of the Red River bottoms, and there both sirup and sugar are manufactured.

In 1919, 1,208 acres of oats were grown in the parish. Seeded in October this is one of the surest crops. It may be planted as late as February. The crop is cut during the latter part of May or early June, but is not threshed. Red Rustproof is the variety most commonly grown. The crop produces well on the ordinary upland soils and on the high bottoms. It reaches a height of 3 or 4 feet and is well headed out.

Bermuda grass appears to form the most productive pasture and hay grass on both uplands and bottoms. Although it is a permanent grass and forms a good sod, in this region it does not smother out various clovers and grasses, which commonly form a considerable part of the total growth. On the limy upland and bottom soils it is commonly mixed with much white clover, some lespedeza, and bur clover, and in places carpet grass. The sod is heavier in the older pastures. White clover comes up in February or March; Bermuda grass makes its growth from about March 1 till frost; lespedeza is more noticeable in the fall. Bermuda grass produces well on all types of soil, but is commonly grown along the bayou banks and on the heavier soils back from the front land. Bermuda grass survives prolonged overflow, and a good crop of clean hay may be cut 3 or 4 weeks after the water recedes. The

grass commonly grows about 15 inches high. Three cuttings are obtained, the first early in May, with a total yield of about three-fourths ton to 2 tons per acre on both sandy and clay soils. In the uplands, Bermuda grass is usually mixed with lespedeza and carpet grass. This mixture gives excellent pasture and may sometimes be cut for hay.

The natural pasture growth of the upland includes broom sedge, carpet grass, other grasses, and lespedeza. It is the common practice of settlers to burn over the dead broom sedge in the forest. The board of conservation urges the discontinuance of this practice, as the more productive grasses and legumes give way to the less nutritious broom sedge after burning. Some observant farmers uphold this view. Switch cane was formerly a widespread growth in and near the bottoms, and a few protected ranges still furnish winter forage. There is an abundance of mast nearly every year.

Peanuts were grown on 736 acres in 1910, with a yield of 11,355 bushels. The crop is grown largely as forage for hogs, and to some extent for hay. It is especially adapted to the deeper sandy loams and sands, and has a tendency to enrich the land, succeeding yields of corn or cotton ordinarily showing increase. The red Spanish peanut is the variety generally preferred. Hay from this variety is estimated to run about 1 ton per acre. Hogs fatten in the peanut fields, but need to be hardened on corn.

Peaches and figs are the only common fruit trees. They produce fairly well in all parts of the parish. Some pears, plums, and cherries are grown. Grapes do fairly well in the upland, and one fine, productive vineyard was observed in the river bottom. In good years pecans are shipped in carload lots from various points in the river bottom. The nuts are nearly all from native trees, but the improved varieties seem to thrive.

Ridge cultivation is generally practiced both in the uplands and bottoms. In the uplands the rows are usually run with the contours of the slope, but terracing receives little attention, although it is advisable even on the gentler slopes.

No commercial fertilizer is used on the Red River lands, as they are naturally very rich. Small amounts are used on some farms on upland soils. The total expenditure for fertilizer in 1919 was $12,040, on 281 farms reporting.

The river-bottom lands are farmed mainly by tenants under the supervision of the owner. As a rule the owner furnishes housing, implements, mules, and seed, and the crop is divided equally. Most of the upland farms are operated by the owners. On rented land, under a common agreement, the landlord furnishes only land and housing, and receives one-third of the corn and one-fourth of the cotton and cottonseed. Other leases are similar to those common in the bottoms.

Much of the river-bottom land is held in large tracts, some of several thousand acres, and these holdings are divided into tenancies. In 1919 the average size of farms[2] was 52.4 acres, of which 27.4 acres was improved land. Of the total number of farms, 34.7 per cent were operated by the owners, 64.9 per cent by tenants, and 0.4 per cent by managers.

[2] The census tabulates each tenancy as a farm.

The higher river-bottom lands at present (1921) are valued at $40 to $125 an acre. Normally they are held at somewhat higher figures. Cut-over land in the uplands can be obtained for about $7.50 to $15 an acre; this tends to hold the valuation of similar improved lands at a comparatively low level, usually about $20 to $30 an acre.

Large areas of rough, hilly land, stony land, intractable clay land, and deep droughty sand, particularly in the section south of the Red River bottoms, are better adapted to forestry and grazing than to any other purpose. By keeping out fires, valuable second-growth crops of pine may be obtained, and the grazing improved. Longleaf pine should be regarded as a valuable crop. Forestry, or rather reforestation, should be given much more serious consideration than it has been given. Well-stocked areas of young pine probably could be sold to paper mills and lumber mills, even in advance of maturity.

SOILS.

The soils of Natchitoches Parish are light in color, having developed under forest cover where the proportion of plant root per unit mass of soil is always small as compared with the proportion found in soils developed under grass cover. They lie in that part of the warm temperate zone where the annual rainfall and the temperature are relatively high and weathering is relatively rapid, and its results decisive. The materials to be converted into soils in this region consist of clays, silts, and mixed sands, silts, and clays, the sands being fine in grain. One or two thin beds of calcareous marls are present also and occasional beds of indurated silts and fine sands are found. The predominant material is rather heavy clay. These beds, with the exception noted, are unconsolidated and are of late geological age.

The parish lies in a region in which the profile of the normally well-developed soil consists of a relatively light-textured surface horizon, a relatively heavy horizon in what is usually designated as the upper part of the subsoil, and a third horizon or layer consisting of the slightly changed or unchanged parent material, or geological material, that may or may not be heavier than either of the two true soil horizons.

In regions, however, where the topography is rather uneven and the rocks unconsolidated, where the topographic and geologic conditions favor rather rapid erosion, the true or normal soil profile may not develop, or if it develops at all such development may take place in small areas only. This retardation of profile development is favored also and made much more certain of occurrence in regions in which the predominant parent rock is a heavy clay. In such cases weathering and the formation of a normal soil profile, even under otherwise favorable conditions, proceeds very slowly.

The greater part of the upland of Natchitoches Parish is rolling. The valleys are not deep, but the whole parish with minor exceptions, such as the "flatwoods" region in the northeastern part of the parish, is thoroughly dissected, and the slopes are relatively steep. The greater part of the geological formations underlying the parish consist of relatively heavy clay beds.

It is evident, therefore, that both conditions mentioned above which delay, or prevent entirely, the development of a normal soil profile are present in this parish. It is to be expected that the prevailing upland soils in the parish would be marked by the presence of an imperfectly developed profile.

The predominant upland soils consist of the members of the Susquehanna series. The members of the series present are the clay, the fine sandy loam, and the very fine sandy loam. They cover altogether nearly 200,000 acres in the parish, the fine sandy loam with its two phases covering more than half the total.

The Susquehanna soils consist, as a rule, of the relatively light textured surface layer or horizon referred to above, underlain by the more or less oxidized but otherwise slightly changed clay that constitutes the parent geological formation. The second of the two true soil layers, the relatively heavy layer, is absent from the soil section as a rule, though not in all cases. In Lonoke County, Ark., for example, there is a large area of Susquehanna fine sandy loam in which the second horizon has attained a considerable degree of development. As a rule, however, wherever soils of the series have been mapped they consist of the surface layer and the deeper or third layer, with the second layer lacking. This seems to be invariably true of the clay type.

The fine sandy loam in Natchitoches Parish consists of a surface layer, about 8 inches thick, of fine sand or light fine sandy loam. This is underlain by red heavy plastic clay containing gray spots. The gray spots increase downward until at a few feet, usually less than 10, they constitute a considerable part, sometimes all, of the material. The red color is due to oxidation of the iron contained in the clay originally in some form other than oxide.

The very fine sandy loam has essentially the same profile, the sand being finer in grain than in the fine sandy loam. In both cases the sandy layer is pale yellow in color, with an inch or so of dark-colored material at top in the uncleared forest land. Even the clay type in this parish has a sandy upper layer from 1 inch to 2 inches in thickness, but in this case it is so thin that when the land is plowed the heavy clay texture is not noticeably modified.

Although the predominant soils of the parish have a section in which the normally present heavy or second layer is absent, there are present other upland soils in which the normal section appears. They are the various members of the Ruston, Norfolk, Kirvin, Orangeburg, and Caddo soils. They occupy a relatively subordinate area, although in actual area they are not unimportant. They cover altogether about 120,000 acres, the Ruston fine sandy loam, with about 46,000 acres, forming the larger part of this total.

They occupy, seemingly without exception, areas that are smooth and not subject therefore to rapid erosion. They have lain undisturbed in their present position long enough to have permitted the development of the normal soil section of the region. It is apparent also, though not fully demonstrated, that they have developed from parent geological material that was originally more sandy than the heavy clay bed from which the Susquehanna soils have been formed.

The Ruston soils, of which there are two types in this parish, the fine sandy loam and the fine sand, have a surface layer of grayish,

yellowish, or yellowish-brown, quite sandy material underlain by a reddish, heavier second layer at a depth that ranges from 6 to 15 or 20 inches. The second layer is underlain usually at about 40 inches by somewhat sandy material, though, as has been stated, above this layer the parent material may vary considerably in texture. In the fine sand type the second horizon, although somewhat heavier than the surface horizon, is much more sandy than the second layer in the fine sandy loam.

The Orangeburg soils differ little from those of the Ruston series, the chief difference consisting of the much redder color of the second horizon in the former than in the latter. Only one type, the fine sandy loam, is mapped.

The Norfolk soils differ from the Ruston in the opposite way from which they differ from the Orangeburg. The first layer is a good deal alike in both, being a little more brown in the Ruston than in the Norfolk. The second layer in the Norfolk is yellow rather than slightly red as in the Ruston. The third layer is much alike for the three series.

The Kirvin soils in superficial appearance are much like the Orangeburg soils. The first horizon is light in color in both and the second horizon is bright red in both and heavier than the first horizon. The red second layer of the Orangeburg soils, however, is made up of sandy clay and is very friable. That of the Kirvin soils has a much lower percentage of sand and is quite stiff and when dry is hard. The Kirvin soils seem to be more closely related to the Susquehanna soils, when looked at from the point of view of the texture of their parent material, than to the other soils in the group having the normal three layers well developed. The Kirvin soils may be considered as Susquehanna soils in which the layer that in the latter is only partially oxidized and is still highly plastic has been more completely weathered and aerated and has become less plastic. Only one type of the Kirvin series, the fine sandy loam, is mapped in the parish.

All the soils of the group of series just described lie along the watershed ridges and in other places where the topography is smooth and the surface drainage good.

The Caddo soils belong in a slightly different group than the Ruston and other normally developed series. They have a well-developed surface layer and a second layer well developed in its greater part, but having at its base a zone of imperfectly drained material that may or may not be rather hard and impenetrable. The surface or first layer is grayish or yellowish, much like that of the other soils of the region. The second horizon is yellowish like that of the Norfolk series, and the third horizon is mottled gray and brown. These soils occur in situations lower than those of the other soils described. The surface is dotted with many low mounds ranging up to 4 feet high and 10 or 15 feet in diameter.

There are three other series of soils on the uplands in Natchitoches Parish, all of them resembling the soils of the Susquehanna series in their lack of a well-developed second layer in the soil section.

The Lauderdale series is represented in Natchitoches Parish by two types, a fine sandy loam and a stony fine sandy loam. The soils are gray and underlain by a tough plastic gray to bluish-gray clay.

It could be considered essentially like the Susquehanna fine sandy loam, the difference between them consisting in the color of the subsoil which is gray rather than red.

The Natchitoches series was created in this parish to cover a series of soils that do not differ in fundamental essentials from the Susquehanna soils or from the Lauderdale soils. Only the clay type has been mapped.

The Sumter soils are usually brownish to yellowish, ranging in extreme cases to a slightly dark brown color. Beneath the surface layer, rarely more than a few inches thick, lies a highly calcareous clay. This is the parent geological formation. The lime carbonate in it is part of the rock and is not a product of soil making. It is *geological* lime rather than *soil* lime.

The rest of the soils mapped in the parish have been derived from alluvial deposits. These deposits are both recent and old. The soils derived from the old alluvial deposits have a profile essentially as fully developed as in the normally developed soils on the uplands. The recent alluvial soils have merely a sedimentary section, its character depending on the conditions prevailing during the deposition of the material.

The soils derived from old alluvial deposits are those of the Muskogee, Teller, Cahaba, Myatt, Kalmia, and Bastrop series. They differ from each other in the varying degrees of drainage and the source of the material from which they were derived.

The recently deposited alluvium has been grouped in the Miller, Yahola, Bibb, Perry, Catalpa, Buxin, and Ochlockonee soils. The separation is based on conditions of drainage and source of material.

The terraces of the Red River in the parish are classified in three soil series, the Bastrop, Teller, and Muskogee. The Bastrop soils have chocolate-brown surface soils overlying a chocolate brownish red, highly calcareous subsoil. Drainage conditions are good. The Teller soils have light-brown surface soils overlying a reddish-yellow or yellowish-red friable sandy clay subsoil. Drainage conditions are good. They represent old Red River alluvium which has been considerably altered by leaching and weathering, having lost the purplish-red color almost completely. The Muskogee soils are pale-yellow or yellowish-brown soils overlying a mottled yellow, red, and bluish-gray plastic clay subsoil. The drainage is deficient. Alteration has been great in this case also, but, unlike the Teller, the change has taken place under wet conditions. All the lime carbonate, in so far as acid tests indicate, has been leached out, and the underdrainage, in contrast to that of the Miller clay, representing the same material in the unleached condition, is poor.

The terraces of the local streams in the parish are classified in three soil series, the Cahaba, Kalmia and Myatt. The Cahaba soils have brownish-gray to brown surface soils overlying a reddish-yellow or yellowish-red, friable sandy clay subsoil. The Kalmia soils have grayish-yellow to yellowish-brown surface soils overlying a yellow friable sandy clay subsoil which may be mottled with gray in the lower part of the 3-foot section. Drainage conditions are fair to good. The Myatt soils have gray surface soils, overlying a mottled gray and yellow subsoil. The drainage is very poor.

The first-bottom soils of the local streams are classified in three series, the Ochlockonee, Catalpa, and Bibb. The Ochlockonee soils have brown surface soils overlying a yellow subsoil, usually strongly mottled with bluish gray in the lower part. They are subject to overflow, but between overflows are fairly well drained. The Catalpa soils have brown surface soils, overlying a yellow calcareous subsoil. They are derived from wash from calcareous uplands, such as the Sumter soils. They are subject to overflow, but between overflows are fairly well drained. The Bibb soils have gray surface soils overlying a gray or mottled gray and yellow subsoil. In this parish they are mostly of material worked from the gray Lauderdale soils. They are subject to overflow, and the drainage is deficient.

The first-bottom soils of the Red River are classified in five series, the Miller, Yahola, Portland, Buxin, and Perry. The Miller series has brownish-red surface soils overlying brownish-red, highly calcareous, relatively heavy textured subsoils. The Yahola soils have brownish-red surface soils overlying a brownish-red, highly calcareous, relatively light textured subsoil. The Portland soils have chocolate-brown to dark reddish brown surface soils, with more or less mottling of bluish gray, overlying chocolate-brown heavy subsoils. The Buxin soils have purplish-red to dark reddish brown surface soils overlying a blue or mottled bluish-gray and reddish, heavy, plastic subsoil. The Perry soils have mottled bluish-gray and chocolate-brown soils overlying a mottled bluish-gray and purplish-red heavy, plastic subsoil. The Buxin and Perry are the most poorly drained of the Red River bottom soils and the Miller and Yahola are the best drained. In the following pages of this report the soils of the parish are described in detail. Their location and distribution are shown on the accompanying map, and their actual and relative extent is shown in the following table:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Susquehanna fine sandy loam	94,016	13.1	Ochlockonee silt loam	14,656	1.8
Deep phase	11,200		Caddo very fine sandy loam	11,264	1.4
Gravelly phase	512		Portland clay	10,304	1.3
Miller clay	93,184	11.5	Natchitoches clay	9,792	1.2
Susquehanna very fine sandy loam	47,680	6.6	Kalmia fine sandy loam	7,872	1.0
			Cahaba fine sandy loam	7,168	.9
			Myatt very fine sandy loam	6,976	.9
Flat phase	5,888		Yahola silt loam	6,912	.9
Ruston fine sandy loam	45,888	5.7	Buxin clay	6,656	.8
Yahola very fine sandy loam	38,400	4.7	Norfolk fine sandy loam	6,592	.8
Ochlockonee fine sandy loam	36,096	4.5	Muskogee silt loam	6,528	.8
Yahola clay	33,408	4.1	Orangeburg fine sandy loam	6,336	.8
Susquehanna clay	25,280	4.1	Sumter clay	5,632	.7
Flat phase	8,128		Riverwash	5,312	.7
Bibb very fine sandy loam	29,440	3.6	Ruston fine sand	4,800	.6
Perry clay	28,672	3.5	Miller silt loam	3,712	.5
Norfolk fine sand	26,752	3.3	Ochlockonee fine sand	3,584	.4
Teller very fine sandy loam	16,960	2.8	Kalmia fine sand	3,200	.4
			Teller fine sandy loam	2,240	.3
Imperfectly-drained phase	6,016		Muskogee clay	2,112	.3
Lauderdale fine sandy loam	21,376	2.6	Teller fine sand	1,280	.2
Muskogee very fine sandy loam	20,928	2.6	Catalpa clay	1,088	.1
Kirvin fine sandy loam	18,944	2.3	Bastrop clay	1,024	.1
Lauderdale stony fine sandy loam	17,152	2.1	Yahola very fine sand	1,024	.1
			Cahaba fine sand	448	.1
Miller very fine sandy loam	15,872	2.0			
Bowie very fine sandy loam	15,680	1.9	Total	809,600	
Lauderdale clay	15,616	1.9			

ORANGEBURG FINE SANDY LOAM.

The surface soil of the Orangeburg fine sandy loam is a light-brown to brownish-gray fine sand grading at about 2 inches into reddish-yellow or buff-colored to reddish-brown fine sand to loamy fine sand. This grades at about 8 to 12 inches into red friable sandy clay. In places the lower part of the 3-foot section is a more friable clay, with a considerably larger content of sand, and the substratum is very friable.

The type occurs in numerous areas in the drainage basin of Saline Bayou. It occupies flats at the highest elevations in the sand hills at the northern border of the parish. A few small areas, associated with Norfolk sand near Oshkosh, constitute a deep variation of the type, the sandy clay coming in at about 18 to 36 inches. Only a few small areas occur south of the river.

The topography is gently rolling. The drainage conditions are good, and the friable clayey subsoil conserves moisture well. The type is recognized as especially productive, as compared to the other sandy upland soils, and probably 75 per cent of it is under cultivation. The forest growth is mainly of hardwoods, red oak, hickory, dogwood, and gum, but also includes much pine. Wild grapevines are common.

Cotton and corn are the principal crops. Cowpeas, velvet beans, and peanuts do well and are grown to some extent. Cotton yields ordinarily about one-third bale per acre, and corn about 15 to 25 bushels. Bermuda grass forms fairly good pasture, with other grasses and lespedeza, but very little of the farm land is used for pasture. It is said that sweet potatoes and sugar cane grown on this soil are not of as good quality as on the deeper sandy soils.

The Orangeburg fine sandy loam elsewhere is regarded as somewhat more productive than the Ruston and Norfolk soils, and with the use of commercial fertilizers and legume crops it may be brought to a considerably higher state of cultivation. The slopes should be protected from washing, as deep gullies, cutting into the lower, friable subsoil, are very difficult to check.

RUSTON FINE SAND.

The Ruston fine sand is grayish-yellow to light-brown fine sand, grading at about 10 to 24 inches into reddish-yellow to yellowish-red fine sand. The lower part of the 3-foot section is in places loamy, and slightly loamy sand generally occurs below the 3-foot section.

The type is associated with the Norfolk fine sand, occupying high levels and adjacent gentle slopes in the sand hills, and occupying the ridges of the higher hills in the basin of Saline Bayou and in the west-central part of the parish. The topography is generally gently sloping and favorable for farming, and probably one-third of the type is under cultivation. The forest growth is of longleaf pine, post oak, and blackjack oak.

Corn is somewhat subject to drought on such light soils. Cotton grows from 1 to 3 feet high, and generally develops well, and as the foliage is not as dense as on the stronger soils, shade and moisture conditions are less favorable to the boll weevil, and average crops are produced. Cowpeas and peanuts produce well, peavine hay

yielding a ton or more per acre. Sweet potatoes yield well and the quality of the potatoes is good. Following cowpeas, fair crops of corn are obtained in ordinary seasons.

The smooth topography and light texture of the soil make it easy to cultivate, and in the ridge positions it is very little affected by washing. It is somewhat stronger than the corresponding Norfolk fine sand, and altogether represents the better land of the sand hills.

RUSTON FINE SANDY LOAM.

The Ruston fine sandy loam is typically a brownish-gray fine sand, passing at about 4 to 6 inches into pale-yellow fine sand, which grades into yellow fine sandy loam, this passing at about 12 to 16 inches into reddish-yellow or yellowish-red friable fine sandy clay. The texture of the surface soil is rather fine, approaching a very fine sand, and areas of Ruston very fine sandy loam have been mapped with the type.

Soil of somewhat different lower subsoil characteristics occurs extensively in the northern part of the parish, mainly along Saline Bayou. Here the friable sandy clay subsoil extends well below the 3-foot section, and in many places the color approaches the deeper red of the Orangeburg.

The topography is mainly gently rolling, and favorable for tillage. The drainage conditions are good, and the friable subsoil has good moisture-holding capacity.

The type occurs in numerous places through the west-central part of the parish and in a few places in the southern part, in association with the Susquehanna soils. The soil here is quite commonly a variation from the type, ranging from typical Ruston to a phase intermediate between Ruston and Susquehanna. The surface soil and upper subsoil appear typical in color and structure. The lower subsoil is mottled yellow, pale yellow, and red or reddish yellow. In exposures it appears like the subsoil of the Susquehanna, but it contains much more sand and is more friable. Ferruginous fragments are present in the soil and subsoil in places, but they are not abundant. The topography is gently rolling to rolling, and the drainage conditions are good. This variation really represents a member of a different series.

At least 75 per cent of the type is in forest. The growth on the larger areas is mixed pine and hardwoods, red oak, white oak, post oak, dogwood, hickory, and gum.

Cotton and corn are the principal crops. Cowpeas, peanuts, and velvet beans produce well, but are not extensively grown, as little forage is needed. Broom sedge is the common grass, but Bermuda grass grows well, with some carpet grass in lower situations. Lespedeza grows to some extent, but does not make a heavy stand. Cotton yields an average of about one-third bale per acre, corn 15 to 25 bushels, sweet potatoes 150 to 200 bushels, and sugar cane 200 to 250 gallons of sirup. Very little fertilizer is used.

The tree growth is noticeably larger than on adjoining Susquehanna soils. The type is recognized as one of the better upland soils, and the acreage under cultivation is being increased slowly, as the cut-over lands are occupied. In other parts of the Coastal

Plain, where the type is extensive, it constitutes good farm land. By the use of commercial fertilizers and the growing of legumes more extensively the type may be built up to a high state of productiveness. Terracing of the slopes is advisable, as the friable subsoil may be badly gullied.

NORFOLK FINE SAND.

The Norfolk fine sand is typically a loose gray fine sand, grading into pale-yellow fine sand, which extends to a depth of 3 feet or more, the yellowish color becoming more pronounced with depth.

The type is extensive in the parish. It occupies a considerable body of high sand hills on the northern border, and small isolated hilly areas south and southeast nearly to Black Lake. It is the predominant soil in a wide range of hills extending from the river bottom near Montrose south and west to Lotus, then west to the parish line. Many of the higher elevations through the west-central part of the parish are occupied by these deep deposits of sand.

The sand hills lie well above the surrounding country, rising rather steeply in many places, and forming long rounded ridges. The numerous stream valleys and ravines are narrow and deep, with slopes frequently as steep as the material will permit. The mass of the ridges is of other heavier materials, but the deep beds of sand have a fairly uniform thickness over the inequalities of ridges and valleys. In the northern sand hills the substratum is generally a red sandy clay or sand, frequently reached by the numerous burrows of ants and salamanders; in some strips the red material occurs in the 3-foot section and represents inclusions of deep Ruston fine sand. In the southern part of the parish the sand covers the formations which give rise to the Lauderdale soils, and occasional small pinnacles of rock project above the sand on the ridges or outcrop on the slope. However, even on the lower slopes the sand is rather uniformly very deep. It may be in part colluvial. The texture of the sand in this section varies from fine to medium, the fine sand often occupying the ridges and the medium sand occurring on the slopes.

The open sand absorbs the rainfall readily. The sand-hill springs never fail, but the soil is subject to drought. Where covered by forest, the slopes do not wash, but in cultivated fields steep slopes of any length are deeply gullied. The position and lay of the ridge areas is favorable in this respect, and they are farmed in a few places. One-fourth to one-third bale of cotton is produced on new land, but without fertilization the yields decrease. The cotton plants are low, without heavy foliage, and produce early in the season, which tends to reduce damage to the crop under boll-weevil conditions. Yields of corn are low. Spanish peanuts yield well, and are especially profitable for hog pasture. When the land is manured and plowed deep, good moisture conditions obtain. One of the best gardens seen in the parish was on this soil. Sweet potatoes and watermelons produce well. Even at the higher locations peach trees do not produce heavily or regularly, but on the whole this type is among the most satisfactory orchard soils in the parish, as the trees mature at an early age, and are in considerable measure protected from damage by late frosts by the high location and good air drainage.

Nearly all the type is in forest of longleaf pine, and blackjack and bluejack oak. The longleaf pine grows in very light stands, and the trees seldom reach a diameter of more than 18 inches. On cut-over land the scrubby blackjack and bluejack often form dense thickets over large areas. In open places broom sedge grows scatteringly throughout the sand hills. The greater part of this soil, on account of the slope, is of little agricultural value.

NORFOLK FINE SANDY LOAM.

The surface soil of the Norfolk fine sandy loam is a grayish-brown loamy fine sand to fine sandy loam about 10 to 15 inches deep. This is underlain by yellow friable fine sandy clay.

The type occurs in the southwestern part of the parish in the upper part of the Kisatchie Valley. It occupies levels well above the streams, and is flanked by the clayey and stony formations of the district at both higher and lower levels.

The topography of the type is undulating to gently rolling, and favorable for cultivation. The drainage conditions are good. As the district is thinly settled, nearly all the type is in forest of longleaf pine. Large areas of this soil are developed elsewhere in the Coastal Plain and it constitutes a good farm soil of the same general adaptation as the Ruston and Orangeburg soils.

BOWIE VERY FINE SANDY LOAM.

The surface soil of the Bowie very fine sandy loam is a brownish-gray very fine sandy loam grading at about 2 inches into light-yellow very fine sandy loam. This is underlain at about 10 to 15 inches by yellow or reddish-yellow very fine sandy loam to very fine sandy clay. The lower subsoil is a mottled yellow, red, and gray friable very fine sandy clay.

The type is extensive in the northwestern part of the parish, and in places in the west-central and southwestern parts. The surface is undulating or gently sloping. The slope is usually sufficient to give satisfactory drainage, and moisture conditions within the soil are favorable to crop production. At least three-fourths of the type is in forest of shortleaf pine, oak, sweetgum, and other trees.

Cotton and corn are the principal crops. Cotton averages about one-third bale per acre, corn 10 to 20 bushels. A good quality of sugar cane is produced. Cowpeas, velvet beans, and peanuts produce well. Very good pasture of Bermuda grass, lespedeza, and carpet grass were observed. The land is capable of being built up to a high state of productiveness.

CADDO VERY FINE SANDY LOAM.

The Caddo very fine sandy loam consists of gray loamy very fine sand or very fine sandy loam underlain at about 8 to 12 inches by mottled yellow and gray friable very fine sandy clay, with a compact layer of very fine sandy clay at depths of about 20 to 30 inches.

The type is developed extensively in the flatwoods in the vicinity of Mora. The smaller drainage ways occur only at rather wide in-

tervals, and are only slightly below the general level. Even on appreciable slopes the drainage is deficient, and rather large patches are wet from seepage. Practically all the type is in forest of longleaf pine, of good stand and vigorous growth. Shallow root development is noticeable in trees uprooted by wind.

Broom sedge, carpet grass, and lespedeza provide fairly good grazing and the cut-over lands could well be used for pasture.

Small areas of similar soil but of fine sandy loam texture in the northern part of the parish are included with this type. These areas are in the midst of Susquehanna soils, and a plastic clay substratum appears to occur quite generally a little below the 3-foot depth. The underdrainage is poor, as it is in the typical areas of the very fine sandy loam.

SUSQUEHANNA FINE SANDY LOAM.

The Susquehanna fine sandy loam consists of gray, grayish-brown or grayish-yellow fine sand, loamy fine sand or fine sandy loam, grading at about 3 or 4 inches into pale-yellow loamy fine sand to fine sandy loam, and this into yellow or reddish-yellow fine sandy loam. This is underlain at about 6 to 12 inches by red, plastic, heavy clay, which passes into mottled red, yellow, and bluish-gray plastic heavy clay. The thickness of the solid red subsoil layer is variable, being generally greater on the upper slopes and steep slopes. The gray mottling increases with depth. The substratum at 5 or 6 feet is often of solid bluish-gray or pale-yellowish color. Small iron concretions occur scatteringly in the surface soil, and in places the red and yellow mottlings in the subsoil consist of friable ferruginous material. Here and there angular fragments of ferruginous material occur in the soil and subsoil, but are not nearly as abundant as in the Kirvin soils. Locally the subsoil consists of friable fine sandy clay interbedded with plastic clay, such interbedding representing an approximation, structurally at least, to the geological parent material. Though the degree of plasticity is somewhat variable, it is practically everywhere sufficient to cause a deficiency of capacity for absorbing and retaining moisture.

The type occupies large areas in all sections of the upland. The topography is mainly rolling to hilly. Even the smaller drainage ways are deep, and the slopes are traversed by numerous hollows and dips, giving a surface configuration with irregular contour lines. The range of slope for good drainage conditions is limited, as the level areas are inadequately drained, and on moderate slopes the run-off is heavy. The surface soil absorbs rainfall readily, but where the sandy soil passes abruptly into heavy clay, the water accumulates and the saturated surface soil is washed away, so that the red clay is exposed in patches on slopes cultivated for any length of time.

The type is nearly all in forest. The growth is longleaf and shortleaf pine, post oak, blackjack oak, hickory, dogwood, and other trees. Blackjack oak is most common on cut-over land.

Some ridge areas and gentle slopes are farmed. Cotton is the principal crop, yielding ordinarily from one-fourth to one-half bale per acre, the higher yields being from newly cleared fields. Corn yields 10 to 20 bushels. Sweet potatoes do not give as large yields, nor of as good quality, as on more friable soils. Cowpeas and velvet beans are grown for forage.

Much of the type could well be used as pasture lands, and also for the production of pine. Bermuda grass thrives where it is established, and broom sedge, carpet grass, and lespedeza form a good growth in abandoned fields.

Susquehanna fine sandy loam, gravelly phase.—The gravelly phase includes a few areas that are similar to the type but have a higher gravel content. They are shown on the map with gravel symbols. The gravel consists of rounded chert and quartz. The areas of extremely gravelly nature are somewhat difficult to plow when dry, while those of moderate gravel content have essentially the same value as the typical fine sandy loam, being perhaps slightly better suited to such drought-resistant crop as cotton.

Susquehanna fine sandy loam, deep phase.—The deep phase of the Susquehanna fine sandy loam consists of gray fine sand to slightly loamy fine sand, passing at about 4 to 8 inches into pale-yellow or yellowish-gray fine sand to loamy fine sand, and this abruptly, at about 15 to 25 inches, into mottled red, yellow, and gray, heavy, plastic clay. In many places there is considerable fine sand in layers in the clay, but the clay mixed with this sand is plastic, so that the mixed material is penetrated very slowly by soil moisture.

The phase is extensive in the northern part of the parish along the upper courses of the streams draining to Saline Bayou. It is associated with the Norfolk fine sand, which occupies isolated hills in this section.

The topography is gently rolling to hilly. The longer slopes are traversed by shallow hollows and dips, giving the surface an irregular configuration. The surface drainage is adequate, but the heavy subsoil retards the downward passage of water. After rains water is retained in the lower part of the sandy material for some time, and occasional seepy patches occur.

Little of the phase is farmed. The timber growth consists of vigorous stands of longleaf pine, with some shortleaf pine. Much of the phase is cut-over land, producing a fair growth of broom sedge, with some carpet grass and lespedeza. The few farms on this soil are productive. Cotton yields about one-fourth bale per acre, or, when fertilized with 200 pounds of cottonseed meal, up to three-fourths bale in good seasons. Corn yields 5 to 20 bushels per acre. Sweet potatoes give lower yields of poorer quality than on more friable soils.

SUSQUEHANNA VERY FINE SANDY LOAM.

The Susquehanna very fine sandy loam is typically a grayish-yellow loamy very fine sand grading into pale-yellow very fine sandy loam to loamy fine sand, underlain at about 8 to 14 inches by red, heavy, somewhat plastic clay, which passes into mottled red, yellow, and bluish-gray, heavy, plastic clay. The gray mottling increases with depth. The thickness of the solid red upper subsoil varies with the drainage conditions, reaching a foot in thickness on the upper slopes. Small iron concretions occur scatteringly in the surface soil, and there are some aggregates of iron oxide in the upper subsoil.

The Susquehanna very fine sandy loam is an extensive type which occurs intermingled and associated with the fine sandy loam. Little distinction can be made as to topography, character of native growth, or productiveness of the two types.

Susquehanna very fine sandy loam, flat phase.—The surface soil of the flat phase is a brownish-gray to dark-gray very fine sandy loam, grading at about 4 or 5 inches into pale-yellow or mottled pale-yellow and gray fine sandy loam. This is underlain at about 8 to 12 inches by mottled yellow and red, or yellow, red, and bluish-gray, plastic, heavy clay. The upper subsoil may be solid red in color, but this is not so well developed as in the rolling areas. In places there is little red mottling in the subsoil, such areas representing an approach to or an inclusion of Montrose very fine sandy loam. Four miles south of Red Dirt the soil is a dark-gray very fine sandy loam 4 or 5 inches deep, over yellow or pale-yellow loamy very fine sand, which grades at about 15 to 18 inches into mottled light-gray and pale-yellow fine sandy clay, and at about 20 inches into mottled red and bluish-gray, plastic, heavy clay with some yellow mottling. This also is poorly drained, crawfishy land, supporting a good growth of grass. The surface is hummocky in places, with fine sandy loam on the hummocks and very fine sandy loam in the depressions.

This phase is rather extensive in the flatwoods in the southeastern part of the parish, and is developed here and there throughout the Susquehanna uplands. It is practically all in forest. The typical growth on the larger areas is longleaf pine in nearly pure stands. The growth is large and vigorous. In general it is too poorly drained to be considered desirable farm land, but is ideal pine land, and probably should be used for timber production. Some grazing could be had through the forests. A farm west of Chestnut, with a shallow surface soil permitting better surface drainage under cultivation, is said to produce well.

SUSQUEHANNA CLAY.

The Susquehanna clay usually has a shallow covering of grayish-brown or reddish-brown fine sandy loam, sandy clay, or silty clay, an inch or two in depth, passing abruptly into red, stiff, heavy clay, which is plastic when wet. At a depth of 12 to 18 inches yellow and gray mottling appears, the gray increasing with depth, and predominating in the lower subsoil in many places. Small brown iron concretions are commonly found at the surface, and in places shaly fragments cemented with iron are numerous.

The Susquehanna clay is fairly extensive in the west-central part of the parish north of Bayou Santabarb, and in the hills along the lower course of Kisatchie Bayou. The topography is rolling, with many steep slopes.

Practically all the type is in forest of shortleaf pine, post oak, white oak, red oak, blackjack oak, hickory, and other trees. The topography and the heavy soil make it undesirable for farm land. The growing of trees on this stiff land appears to be the proper use to be made of it, particularly as long as much more easily cultivated, friable soils are available.

Susquehanna clay, flat phase.—The flat phase of the Susquehanna clay is like the type in color, texture, and structure, but differs in topography, having a flat to gently sloping surface.

This phase is the most extensive soil in the "flatwoods" in the northern part of the parish. It also occurs in smaller bodies in the central part and in the vicinity of Bellwood.

The surface of the flatwoods nearly everywhere has an appreciable slope, and the streams have cut well below the general level. Poor drainage conditions are due to the impervious nature of the soil and the flat surface. In summer the earth bakes so that it does not readily absorb rainfall, and the small streams are dry for long periods. Scrubby post oak, blackjack oak, and shortleaf pine constitute the characteristic growth. In places the pine makes a good growth, but it is noticeable that the trees are not deeply rooted, vigorous trees falling in storms more commonly than on other types. Very little of the type is under cultivation. It is better suited to forestry than anything else, or forestry and grazing combined. It is too stiff to cultivate economically, as long as more friable soils are easily procurable.

KIRVIN FINE SANDY LOAM.

The Kirvin fine sandy loam consists of brown fine sandy loam to loamy fine sand grading at 5 or 6 inches into yellowish-brown loamy fine sand, and this into reddish-yellow fine sandy loam, underlain at about 10 to 12 inches by deep-red stiff clay which shows little change in the 3-foot section except that the lower subsoil is a little more friable owing to the presence of yellowish oxide of iron material. Reddish-brown and brown angular fragments of ferruginous rock are abundant in the surface soil. In places the surface soil is reddish brown. About 3½ miles northeast of Robeline the soil consists of grayish-brown, brown, and reddish-brown loamy fine sand, passing at about 5 inches into yellow, reddish-yellow or yellowish-red loamy fine sand, which in turn passes into heavier yellowish-red fine sandy loam underlain at 8 to 15 inches by red or deep-red moderately stiff clay which shows some mottling of yellow friable limonite material in the lower subsoil. There is also present in the subsoil some friable red oxide material, which tends to make the subsoil more friable than that of the Susquehanna. The subsoil, however, is not as friable as that of the Orangeburg or Greenville soils. There is an abundance of angular ferruginous fragments and some roundish concretions on the surface and through the soil.

The Kirvin fine sandy loam occurs in association with the Susquehanna fine sandy loam and very fine sandy loam, and some patches of Susquehanna fine sandy loam are included. It consists of material, originally similar to the Susquehanna, modified by a larger content of iron and by the greater oxidation in well-drained situations. It is most typically developed on the ridges and shoulders of the hills. These soils grade into each other and patches of one are common in the other in sections where the Kirvin occurs.

Most of the type is in forest consisting of post oak, white oak, red oak, blackjack oak, shortleaf pine, hickory, and sweetgum. Possibly 15 per cent of the type is in cultivation, cotton and corn being the principal crops. Cotton yields about one-third bale per acre, and corn about 10 to 20 bushels, the production on new land being

somewhat higher, Bermuda grass and lespedeza form good pastures. Peaches do quite well. This land may be purchased at this time for about $10 to $20 an acre.

The following table gives the results of mechanical analyses of samples of the soil, subsurface, upper subsoil, and lower subsoil of the Kirvin fine sandy loam:

Mechanical analyses of Kirvin fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
432238	Soil, 0 to 4 inches	0.9	0.9	2.4	76.4	4.6	7.6	7.0
432239	Subsurface, 4 to 8 inches	.9	.8	2.3	63.8	14.2	12.3	5.5
432240	Upper subsoil, 8 to 24 inches	.2	.2	1.2	41.2	3.8	8.8	44.5
432241	Lower subsoil, 24 to 36 inches	.0	.2	2.0	57.0	3.0	6.4	31.5

LAUDERDALE STONY FINE SANDY LOAM.

The soil of the Lauderdale stony fine sandy loam varies in depth from a mere film of grayish fine sandy loam to layers a foot deep. Apparently part of this has worked down from sandy deposits on higher ridges. Clay is exposed at the surface in many small areas and in places the lower subsoil consists of freshly decomposed rock of yellow or pale-yellow sandy material with some mottling of light gray in the lower depths. The soil on slopes in places is dark colored, often black, as a result of seepage and a more or less permanent saturated condition. In such places the subsoil is usually bluish gray or mottled bluish gray and pale yellow. A fairly representative profile shows a shallow surface layer of gray fine sand, passing into pale-yellow sand, underlain at depths ranging from a few inches to about a foot by pale-yellow, grayish-yellow, or cream-colored heavy plastic clay to moderately stiff sandy clay.

Strips and patches of prominent rock outcrop are numerous, and much of the surface is littered with large rock fragments. Altogether a large part of the type as mapped approaches the condition of Rough stony land. Some patches are nearly free of stones. The rock material consists of gray or cream-colored sandstone and claystone. Locally this type of land is sometimes referred to as "rocky mountain land."

The type is developed extensively in the southeastern part of the parish. It occupies a large part of the drainage basin of Bayou Barbue from its headwaters to the river bottoms. It is less extensive on the other streams of this section, but occurs at intervals throughout the basin of Kisatchie Bayou to the western boundary of the parish.

The type occurs characteristically as steep slopes and breaks from high ridge levels. However, considerable areas of country here are so dissected by numerous ravines that the stony soil is predominant throughout, as at the headwaters of Bayou Cypre.

The steep slopes give good surface drainage, but there are a considerable number of wet seepy areas, usually mere patches. The forest growth is principally longleaf pine and blackjack oak, with

some scattered black gum. The stand of pine is rather thin, but the trees appear vigorous. The type is nonagricultural, but of value for timber production, and should be used in its entirety for forestry, along with some grazing.

LAUDERDALE FINE SANDY LOAM.

The Lauderdale fine sandy loam is typically a gray fine sand, passing at 1 or 2 inches into a light-gray or pale-yellow fine sand or loamy fine sand, and this at about 6 to 8 inches into yellow, pale-yellow, or grayish-yellow moderately stiff and plastic clay, which grades beneath into cream-colored to light-gray plastic clay. In many places light-gray or cream-colored fine sandy clay of a very stiff, compact nature, is reached at about 18 to 24 inches. Some red mottling, similar to that of the Susquehanna soils, appears in the subsoil in places, such areas representing either an inclusion of Susquehanna or an approximation of Susquehanna material. Patches of Lauderdale clay and also of shallow and stony soil are included in the type as mapped.

The type is moderately extensive in the southeastern part of the parish, and occupies small areas in the southwestern part. It is associated with the Lauderdale clay.

The topography is hilly, the features generally consisting of long, narrow ridges and deep, narrow valleys. The type supports a good growth of trees, varying from longleaf pine and blackjack oak in places to a mixture of post oak, white oak, hickory, and other hardwoods, with black gum in a few places. It is poorly suited for agricultural use except as pasture land. It is a forestry soil and should be used for the one crop, trees, although some grazing could be had, especially under the conditions favorable to proper tree growth, of which the most important is the keeping out of fires. The prevention of fires improves the grazing, according to the statements of some who have observed this feature.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Lauderdale fine sandy loam:

Mechanical analyses of Lauderdale fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
432244	Soil, 0 to 6 inches	3.3	12.0	10.8	40.4	21.2	10.4	2.0
432245	Subsoil, 6 to 36 inches	.0	.2	.2	4.3	16.4	28.7	50.0

LAUDERDALE CLAY.

The Lauderdale clay is a pale-yellow to cream-colored, plastic, sticky, heavy clay passing into grayish-yellow clay which dries out on exposure to a whitish or cream color. Bluish mottling is noticeable in places, and some patches contain reddish mottling. An area near the turpentine still south of Derry consists of pale-yellow or grayish-yellow heavy clay, which is sticky when wet, passing at one or two inches into mottled pale-yellow and light-gray or cream-colored, plastic very sticky, heavy clay with some bluish-gray mottling in the

lower part. Occasional outcrops of white sandstone and claystone occur on the slopes.

The type is of moderate extent through the southern part of the parish. The topography is flat to steeply rolling. Nearly all the type slopes sufficiently to give rapid surface drainage. Some of it occurs as flat plateaulike areas, with precipitous, rocky, gullied slopes surrounding or partly surrounding it.

Most of the type is in forest of pine, blackjack, and post oak. The stand of longleaf pine is not so thick as on soils like the Ruston, but there are many valuable trees in the virgin growth. Cut-over lands support a patchy to fair growth of broom sedge. The land has a fair value for forestry and grazing but it is not adapted to crop production.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Lauderdale clay:

Mechanical analyses of Lauderdale clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
432242	Soil, 0 to 6 inches	2.2	0.6	1.2	9.8	11.8	15.4	59.2
432243	Subsoil, 6 to 36 inches	.8	.4	.4	3.2	7.9	14.3	73.0

SUMTER CLAY.

The surface soil of the Sumter clay is a brown to dark-brown or greenish-yellow clay passing at 5 or 6 inches into greenish-yellow to brown, heavy, somewhat plastic clay. This is underlain at about 10 to 24 inches by pale greenish yellow clay with a large content of greensand, passing at about 28 to 40 inches into stiff greenish-yellow greensand material and chalky lime. The soil itself has a small content of greensand, and carbonates are not sufficiently abundant to give effervescence with hydrochloric acid, but the subsoil is usually calcareous or contains lime carbonate concretions. In places the soil is very dark brown to black and the subsoil is a dark-brown clay grading below into greenish-yellow and whitish chalky material. These areas, such as are found in patches east of Creston, represent an inclusion of Houston clay or Houston black clay such as is found in the Black Waxy Belt of Texas.

The substratum, as observed in the high bluffs of Black Lake, is composed of beds of greensand marl and soft limestone at least 40 feet in thickness.

The type occupies slopes and eroded areas within the greensand belt, and in some places extends over the minor ridges. It occupies considerable areas northeast of Black Lake, and a few small areas southwest of the river bottoms. At Natchitoches it occupies the bluffs to the terrace and a part of the terrace level.

In the southeastern part of the parish a variation of the type occurs in a belt a half mile or more in width extending from Gorum east nearly to the Rapides Parish boundary, and a few small areas occur at various levels in the hills to the west. The soil here is typically a dark-brown silty clay, grading at 2 or 3 inches into brown plastic clay, passing quickly into yellowish-gray to gray, heavy,

very plastic clay. The lower subsoil effervesces freely with hydrochloric acid. The substratum is of white chalky limestone, apparently only a few feet in thickness. These areas are associated with the Lauderdale soils, and the subsoil closely resembles that of the Lauderdale in appearance. The surface is mainly smooth to gently sloping. The drainage and aeration of the subsoil are imperfect. Under cultivation the soil has washed in patches to the subsoil, even on rather gentle slopes. None of this land is farmed at present. There are a number of abandoned farms in this locality, the soil having been found too difficult to cultivate with the equipment common in this section.

The topography of the Sumter clay is generally rolling, the slopes being traversed by numerous ravines, and the higher positions having a gently rolling surface. Occasional mounds of highly calcareous clay and greensand material littered with clam shells occur on the ridges.

The surface drainage is everywhere good, and moisture conditions in the soil are favorable. Practically all of the type is in forest of post oak, white oak, blackjack oak, shortleaf pine, and honey locust, with occasional clumps of hog haw.

The soil is difficult to cultivate, but for a time, while drying out, it has a crumbly structure and breaks well. In the Black Belt of Alabama, where the Sumter clay is extensively and profitably farmed, it produces good yields of corn, cotton, alfalfa, and other crops. In Natchitoches Parish, where this soil occurs in the midst of large areas of grazing land, it could in many cases be used for the production of supplemental crops of corn and alfalfa, and for Bermuda-grass pasture.

NATCHITOCHES CLAY.

The Natchitoches clay is a red to dark brownish red stiff clay, locally showing some limonite-yellow or greenish-yellow material, passing at a depth of 5 or 6 inches into plastic, heavy, sticky, red clay with greenish-yellow mottling coming in at depths of about 12 to 24 inches. In places there is some grayish mottling in the lower subsoil, and in other places the lower subsoil resembles the Susquehanna. Dark-green grains of glauconite are present in the soil and are abundant in the subsoil and concretions and fragments of reddish-yellow and rusty-brown ferruginous rock are present on the surface. Locally there is an inch or two of brown or reddish-brown clay loam at the surface. The upper subsoil, or red layer, varies in depth to the mottled clay. The content of glauconite grains increases with depth, and in the substratum and in some areas in the lower part of the 3-foot section beds of dark-green, granular, glauconitic sandy material are reached.

In some places, such as 3½ miles southwest of Natchitoches, the soil consists of brown to reddish-brown loamy clay to clay loam, underlain at about 2 inches by red heavy clay containing some dark-green particles of glauconite and a little greenish-yellow material. Below about 12 inches mottled bluish-green and deep-red clay is reached which is more friable than the overlying clay, owing to an abundance of rather friable, greenish, glauconitic material. This extends to depths of between 36 and 40 inches and is underlain by a bluish, friable, glauconitic material, which in places is compact.

To a depth of about 58 inches there is no calcareous reaction to acid, but below this, greenish-yellow, friable, compact, glauconitic material is reached which contains much marly lime material. In an area east of Creston the type consists of red to dark-red clay overlying greenish-yellow, sticky, plastic clay containing much greensand.

The clayey soil and upper subsoil do not effervesce with acid, but in places a somewhat crumbly structure appears on drying. Usually the lime in the substratum is in the form of soft, white, chalky material, but in places it is in the form of limestone.

The greensand beds appear in a belt about a mile in width extending from the Bienville Parish boundary at Ashland, southeast and south to Black Lake. The formation appears again at Natchitoches, and in places toward the southwest to the vicinity of Victoria.

The Natchitoches clay typically occupies gentle slopes and undulating areas in this belt, grading into flatwoods areas of Susquehanna clay to the east. The steeper slopes and eroded areas of the belt are occupied by the Sumter clay.

The type is nearly all in forest, consisting of shortleaf pine, blackjack oak, and post oak. Haws are occasionally seen on shallow soil.

The soil is very difficult to cultivate. In plowed fields it remains wet and tenacious for days after rain, and on drying bakes very hard. On this account very little of it is farmed, although it is recognized as a productive soil. It produces well without fertilization, yielding one-third to one-half bale of cotton per acre, and 12 to 20 bushels of corn. It is recognized as a good oats soil, the crop growing 3 to 5 feet in height and heading out well. In dry seasons the soil is subject to drought.

It is possible that, by improving the structure of the surface soil by plowing under such crops as cowpeas, and by applications of the underlying marl, good yields of alfalfa could be obtained. The greensand marl should prove a valuable fertilizer on other soil types, such as the Ruston fine sandy loam and Muskogee very fine sandy loam, which are deficient in lime. The greensand has a high content of potash, and in places there are limy nodules rich in phosphates. Apparently the deposit is more highly calcareous than in other parts of the State, as described in various bulletins of the agricultural experiment station. No iron pyrites were observed. The formation, as exposed on the bluffs of Black Lake, has a thickness of at least 40 feet of highly calcareous material.

The following table gives the results of mechanical analyses of samples of the surface, subsurface, and subsoil of the Natchitoches clay:

Mechanical analyses of Natchitoches clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
432230	Surface, 0 to 2 inches	0.6	4.1	7.6	27.9	11.3	21.8	26.7
432231	Subsurface, 2 to 12 inches	.2	2.8	5.4	17.0	4.9	19.1	50.7
432232	Subsoil, 12 to 36 inches	.3	4.1	14.1	42.8	6.1	9.3	23.3
432233	Subsoil, 36 to 56 inches	1.4	8.2	18.0	40.0	5.1	7.5	19.7
432234	Subsoil, 56 to 66 inches	.6	5.6	15.0	40.6	6.0	16.7	15.5

BASTROP CLAY.

The Bastrop clay consists of chocolate-brown silty clay, 1 to 3 inches in depth, overlying purplish-red or dark reddish brown silty clay, which passes down into purplish-red, plastic, sticky clay. The soil is moderately calcareous, with a crumbly "buckshot" structure on drying, and the subsoil is highly calcareous, in places containing small nodules of lime.

The type occurs on the Red River terraces, generally occupying the lower situations. It is not extensive. Some small areas occur on slopes to water courses on the higher terraces. These are apparently the result of erosion exposing the unleached substratum of the terrace. On these slopes there are included patches of the leached, mottled Muskogee clay.

At least three-fourths of the type is in forest, the growth consisting of elm, ash, hickory, pecan, sparkleberry, and red haw. A few fields are farmed to cotton and corn. As ordinarily farmed, it is not as productive as the more recent deposits in the first bottoms, and is commonly regarded as hill land. It should prove a good alfalfa soil, and the steeper slopes should make good Bermuda-grass pasture, superior to the noncalcareous soils.

TELLER FINE SAND.

The Teller fine sand is a yellowish-gray fine sand grading at about 4 to 6 inches into pale-yellow fine sand, which passes at about 15 to 30 inches into reddish-yellow to yellowish-red fine sand. In places the lower subsoil is somewhat loamy.

The type occurs in a few small areas in the vicinity of Messick, and south of Provencal Lake. It usually occupies slightly elevated positions. The surface is gently sloping to nearly level.

The type does not hold sufficient quantities of moisture for the best crops of corn, but is well suited to the production of such crops as cotton, peas, peanuts, and sweet potatoes. In agricultural value it is similar to the Ruston fine sand of the uplands.

TELLER FINE SANDY LOAM.

The Teller fine sandy loam consists of grayish-brown fine sandy loam or loamy fine sand grading at about 5 to 8 inches into reddish-yellow fine sandy loam, and at about 15 to 20 inches into yellowish-red or light-red, friable, fine sandy clay.

The type occurs on the Red River terraces in the vicinity of Messick, and west of Saline Lake. The surface is undulating with some gently rolling areas along the slopes to streams. The surface drainage has free outlet and the underdrainage is good.

This type is a productive soil and is largely in cultivation, cotton and corn being the principal crops. In well-cultivated fields cotton averages about a half bale, and in good seasons a bale per acre may be obtained. Corn ordinarily yields 10 to 20 bushels per acre. Cowpeas and velvet beans produce well. Sweet potatoes yield 150 to 200 bushels per acre. This is considered one of the most desirable of the terrace soils of the area, and can profitably be built up to a good state of productiveness.

The following table gives the results of mechanical analyses of samples of the soil, upper subsoil, and lower subsoil of the Teller fine sandy loam:

Mechanical analyses of Teller fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
432284	Soil, 0 to 8 inches	0.4	13.4	1.1	53.6	5.5	19.7	6.4
432285	Upper subsoil, 8 to 20 inches	.0	10.7	.6	53.3	6.8	22.8	5.7
432286	Lower subsoil, 20 to 36 inches	.0	4.8	.9	49.3	6.6	17.4	20.9

TELLER VERY FINE SANDY LOAM.

The Teller very fine sandy loam is a grayish-brown very fine sandy loam, grading at about 2 inches into light-yellow or brownish-yellow very fine sandy loam, and this into slightly reddish yellow heavier very fine sandy loam, which is underlain at about 12 to 18 inches by yellowish-red or light-red friable silty clay, fine sandy clay, or very fine sandy loam. In places the lower subsoil is a yellow friable silty clay mottled somewhat with gray, pale yellow, and reddish yellow.

In some places, as in parts of the area east of Tar Branch about 4 miles south of Allen, the surface is hummocky, low mounds forming the greater part of the surface. The soil of the mounds is typical, but in the depressions the drainage is deficient and hardpan or compactness frequently obstructs the underdrainage. The soil is farmed to some extent, and under cultivation the surface tends to become more nearly uniform.

The type is fairly extensive on the Red River terraces, occupying gently undulating, undulating, and very gently rolling country. The drainage is well established, the larger water courses occupying narrow, rather steep sided gullies some 30 or 40 feet below the general level. The friable subsoil insures good moisture conditions in the soil.

About 50 per cent of the type is in forest consisting of shortleaf pine, dogwood, hickory, sweetgum, black gum, and other hardwoods. The soil is productive. Cotton and corn are the principal crops. The average yield of cotton on well-cultivated land is one-third to one-half bale per acre without fertilizer. Corn yields 10 to 25 bushels and sweet potatoes from 150 to 200 bushels per acre. Cowpeas and velvet beans produce well. Bermuda grass, lespedeza, and carpet grass provide good pasturage.

The type is capable of improvement, as the effect of fertilizer and green manure is lasting; and the texture and structure of the subsoil, and the topography are very favorable.

Teller very fine sandy loam, imperfectly drained phase.—The surface soil of the imperfectly drained phase is similar to that of the typical soil. The subsoil is a yellow friable silty clay or very fine sandy clay, which passes in the lower subsoil into a mottled yellow

or yellowish-red and bluish-gray friable silty clay or very fine sandy clay. The phase is practically the equivalent of the Kalmia fine sandy loam on the terraces of the Coastal Plain region.

The surface is slightly undulating to undulating. An area of more imperfect drainage than common occurs on the east side of Roubeaux Brake. While the mottling indicates imperfect underdrainage and aeration, the soil is not characterized by excessive retention of rainfall, and moisture conditions are good through the summer. The forest growth is similar to that of the typical soil. The sections where this phase occurs are thinly settled, but some of the type is farmed, giving good yields of cotton, corn, and the other common crops. It is considered a good soil. Carpet grass, Bermuda grass, and lespedeza thrive and form good pastures.

MUSKOGEE VERY FINE SANDY LOAM.

The Muskogee very fine sandy loam in areas of virgin soil consists of light-brown to yellowish-brown very fine sandy loam grading quickly into yellow, pale-yellow, or yellowish-brown very fine sandy loam, and this into yellow to reddish-yellow very fine sandy clay at about 10 to 12 inches, which passes through yellowish-red or mottled red and yellow plastic silty clay into plastic clay mottled red or deep red and yellow, with some gray in places. The clay subsoil contains some fine sand and the soil contains small concretions. There are some small mounds of brown very fine sandy loam or loamy very fine sand passing into yellowish-brown or brownish-yellow very fine sandy loam and this into red friable fine sandy clay which in turn passes into mottled red and yellow stiff clay. At a depth of 12 feet or more purplish-red, calcareous clay corresponding to Miller clay occurs quite uniformly, so far as could be determined.

Four miles northeast of Campti the soil is a brownish-gray or grayish-brown very fine sandy loam underlain at 1 or 2 inches by yellow or pale-yellow very fine sandy loam and this at 10 to 12 inches by either yellow, mottled, friable clay, which passes into stiff plastic clay mottled reddish yellow and gray, or by red clay, in places moderately friable, passing down into mottled red, yellow, and gray, plastic, heavy clay.

The type is fairly extensive throughout the Red River terraces. The surface is flat to gently rolling. The streams are well below the general level, but smaller drainage ways are not well established. The flatter areas are crawfishy, and have gray surface soils. The underdrainage is more or less deficient throughout. Very little of the type is farmed. The forest growth consists of shortleaf pine, post oak, sweetgum, and occasionally other hardwoods. French mulberry is a common growth, and red haw grows in places. Carpet grass and lespedeza form a rather dense sod in clearings and afford good pasturage. On sloping areas, with good cultivation, fair crops of cotton, corn, cowpeas and other crops are obtained. The wide flats are probably best adapted to pasture.

MUSKOGEE SILT LOAM.

The Muskogee silt loam typically consists of light-brown silt loam grading at about 3 to 5 inches into pale-yellow silt loam to silty

clay loam. This is underlain at about 6 to 10 inches by mottled yellow, red, and bluish-gray plastic clay. The bluish-gray color increases with depth and the structure becomes more plastic. The soil is generally rather shallow and would plow up as a rather heavy soil.

Some flat, very poorly drained areas consist of mottled gray and rusty-brown or yellowish-brown soil, 2 or 3 inches deep, over a mottled light-gray and light bluish gray subsurface layer, this passing into mottled bluish-gray and pale-yellow clay, with more or less of red. This lighter colored variation is similar to the soil mapped as Wrightsville along the Arkansas River, in Pulaski County, Ark.

The Muskogee silt loam occurs on the terraces along Black Lake and Saline Lake. The surface is characteristically flat, and well-defined drainage ways occur only at wide intervals. The underdrainage is deficient. Considerable areas are crawfishy.

Practically all of the type is in forest consisting of sweetgum and shortleaf pine, with some oak and hickory. "Buckeye" is a common undergrowth. There is a great deal of sweetgum on cut-over land. The clearings have a good growth of carpet grass and other native grasses and lespedeza, and form good pasture land. The shallow soil and deficient drainage make cultivation difficult. There are a few abandoned fields. One of these fields had been plowed deep, producing a heavy soil. Poor yields were obtained, and the field was abandoned. This soil is not regarded as well adapted to cultivation.

MUSKOGEE CLAY.

The Muskogee clay is typically a brown clay to clay loam, grading at 3 or 4 inches into red plastic clay mottled with yellow, and this passing into mottled red, yellow, and bluish-gray, heavy, plastic clay.

The Muskogee clay, as it occurs in this parish, is a variable soil. It has been formed largely by erosion, which has exposed the various beds of deposits occupying short slopes to water ways, in many places rather steep. In patches calcareous clay is exposed. The material is generally heavy, but some very fine sandy loam is included.

The type is inextensive. Very little of it is farmed on account of the slope and the difficulty of working the heavy soil. It is probably of little agricultural value. The forest growth consists of shortleaf pine, gum, oak, and other hardwoods.

The following table gives the results of mechanical analyses of samples of the soil, subsurface, and subsoil of the Muskogee clay:

Mechanical analyses of Muskogee clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
432276	Soil, 0 to 4 inches	0.4	0.6	0.2	18.8	21.8	38.2	19.9
432277	Subsurface, 4 to 18 inches	.0	.0	.4	.8	3.3	43.7	51.8
432278	Subsoil, 18 to 36 inches	.0	.2	.1	.2	7.1	25.2	67.1

CAHABA FINE SAND.

The Cahaba fine sand is a brown fine sand grading at about 12 to 24 inches into light-red fine sand. Locally this grades into light-red loamy fine sand in the lower part of the 3-foot section.

The type has a total area of less than a square mile and occurs mostly on Black Lake Bayou. It usually lies lower than the heavier terrace soils, occupying small areas next to the first bottom or elevations within low, poorly drained terraces.

The type is not subject to overflow. Parts of it are forested with oak, hickory, ironwood, dogwood, and some shortleaf pine; other parts are forested with shortleaf pine, apparently a second growth.

The low situation seems favorable to crop production, and most of the type is farmed. The soil is easy to cultivate and may be planted early. Good yields of cotton, peavine hay, peanuts, and sweet potatoes are obtained, and corn produces well on newly cleared land or following legumes.

CAHABA FINE SANDY LOAM.

The Cahaba fine sandy loam is a brown to grayish-brown fine sand to loamy fine sand, passing at a shallow depth into yellowish-brown loamy fine sand to fine sandy loam, and this at about 12 to 18 inches into dull-red, reddish-yellow, or yellowish-red, friable fine sandy clay.

The type occurs in numerous small areas along the larger streams in the northern part of the parish, and in a few small areas along the streams of the west-central part. It occupies well-drained situations adjoining the first bottom, or, in places, on the higher, older terraces.

The type is largely in cultivation. Cotton and corn are the principal crops. Cotton yields about one-third bale per acre, and corn 10 to 20 bushels. The type can be built up into a very productive soil. It is said that peavine or peanut hay yields up to 2 tons per acre, and that following these crops a bale of cotton per acre has been produced.

KALMIA FINE SAND.

The Kalmia fine sand is a grayish-brown fine sand, grading at about 8 to 12 inches into pale-yellow fine sand, which extends to the depth of 3 feet or more.

Small areas of the type occur at intervals along the larger streams in all parts of the parish. They lie at various elevations, but in all cases are apparently above overflow. The highest areas are perhaps 20 feet above the first bottoms. The open sand drains readily.

Most of the type is in forest of shortleaf pine, oak, maple, dogwood, beech, and other trees. It frequently affords a convenient well-drained building site for bottom-land farms, and is a good garden soil. Moisture conditions are improved by manuring and deep cultivation. Crops may be planted early, and mature early. Sweet potatoes, peas, and peanuts produce quite well, even without fertilizer. The type appears to be especially well suited to the production of Spanish peanuts for hog pasture. Following peanuts or other

legumes, cotton yields well, and in good seasons fair crops of corn are produced.

KALMIA FINE SANDY LOAM.

The Kalmia fine sandy loam is a dark-gray loamy fine sand grading at about 2 inches into pale-yellow fine sandy loam, passing quickly into heavier yellow fine sandy loam, which is underlain at about 14 to 24 inches by yellow, friable, fine sandy clay. Typically there is more or less mottling with gray in the subsoil, particularly in the lower part, but much of the type in this parish is quite free of mottling, indicating that the type is better drained here than in larger areas mapped above the stream benches in other parts of the Coastal Plain.

The type occurs along Saline Bayou, usually occupying rather high positions. The topography is undulating, insuring satisfactory surface drainage, and the underdrainage is good. The forest growth consists of longleaf pine, with some oak and hickory.

The type as mapped along Black Lake Bayou includes areas of very fine sandy loam, with some gray mottling in the subsoil. These areas, however, are fairly well drained through the growing season and the soil is about as productive as the type along Saline Bayou.

The Kalmia fine sandy loam along Saline Bayou is considered a very good farming soil. Cotton averages about one-third bale per acre with little or no fertilization or rotation where the fields are not worn. Corn yields 10 to 20 bushels or more per acre. Sweet potatoes of good quality are produced. Sugar cane gives a good yield of good quality sirup. Cowpeas, velvet beans, and peanuts are good hay and forage crops. By growing these leguminous crops and the moderate use of fertilizers the land may be built up and maintained in a high state of productiveness.

MYATT VERY FINE SANDY LOAM.

The Myatt very fine sandy loam is a light-gray very fine sandy loam, passing at 3 or 4 inches into light-gray very fine sandy clay or fine sandy clay loam, with some pale-yellow mottling, this extending to depths of 3 feet or more, with usually some compaction at depths of 26 to 40 inches. Locally a layer in the lower subsoil is so compact that it is quite dry when the soil above is saturated. In many places a rather plastic clay forms the substratum or a part of it, and in some places this is reached with the 40-inch soil auger.

The type is fairly extensive along Saline Bayou and Black Lake Bayou. Much of the type is hummocky, and includes narrow strips of better drained terrace soils; such areas are known locally as glade land. The higher areas are frequently bounded by narrow swells, causing poor surface drainage. Near Goldonna a few patches of salt lick are included in the type.

The forest growth is of pine, post oak, water oak, and willow oak, with briery undergrowth. A small patch of the type, ditched and in cultivation, is said to drain slowly, and in dry weather corn shows the effects of drought earlier than on the other soils of the terrace. Carpet grass and lespedeza form a fair pasture growth over much of the type. The type is not sufficiently productive of the staple crops to justify the expense of drainage at present.

OCHLOCKONEE FINE SAND.

The Ochlockonee fine sand is a brownish-gray fine sand passing in the subsoil into pale-yellow to gray fine sand or loamy fine sand. It occurs in the bottoms of Kisatchie Bayou, and Bayou Luce, in the southern part of the parish. It lies next to the stream, in comparatively high situations, and is not often overflowed in the growing season. The soil next the stream is gray and quite open and loose; that farthest from the stream is well drained in the upper part, but the lower subsoil is light-gray in color. An area on Saline Bayou at Cloud Bridge is so well drained and so seldom overflowed that it has the appearance of its terrace equivalent, the Kalmia fine sand.

Much of the type is in forest of slash pine, beech, sweetgum, black gum, oak, hickory, magnolia, and numerous other trees. In places the whole width of the type is farmed to corn and other crops. New land produces well and old fields produce fair yields. Corn, if planted in thin stands, produces merchantable grain. On comparatively new land, or where cowpeas are systematically grown, it yields 10 to 20 bushels per acre. Sugar cane is usually planted on newly cleared land; it makes heavy growth and yields a good quality of sirup. Cowpeas and velvet beans produce well. Cowpeas are usually grown in the corn. Cotton yields about one-third bale per acre. Watermelons and sweet potatoes are well adapted to the light soil. Abandoned fields on Bayou Luce support a heavy growth of broom sedge.

OCHLOCKONEE FINE SANDY LOAM.

The Ochlockonee fine sandy loam is typically a yellowish-brown fine sandy loam 6 to 12 inches in depth, overlying yellow friable fine sandy clay, which grades at variable depths into mottled yellow and gray fine sandy clay. Variations in texture and extent of mottling commonly occur in regular order from the stream to the edge of the bottom, the texture becoming heavier as the distance from the stream increases, ranging from fine sandy loam to heavy very fine sandy loam, with some inclusions of silt loam. In a narrow strip along the stream the yellow subsoil may extend to a depth of 3 feet, while toward the outer part of the bottoms the mottling comes in at shallow depths. In places narrow strips of gray Bibb soils occur next the uplands, which were not indicated on the map on account of their narrow extent.

In most places there are several stream channels, the numerous branches paralleling the main stream for considerable distances before uniting with it, so that the bottoms are generally quite well drained. The channels are deep, but narrow and very winding. The type is subject to overflow, but between overflows the drainage is adequate.

At least 75 per cent of the type is in forest, the growth consisting largely of oak, beech, sweetgum, dogwood, ironwood, and ash. In stock-raising sections nearly the whole width of the bottoms is in cultivation. Corn averages 20 to 30 bushels per acre. Sugar cane produces well in the higher situations and may be grown year after year, with little lowering of the yield. Much of the type could be made valuable farm land by dredging and straightening the stream channels.

OCHLOCKONEE SILT LOAM.

The surface soil of the Ochlockonee silt loam is a brown silt loam 6 to 10 inches in depth. The upper subsoil consists of yellowish-brown or yellow silty clay, which grades into a lower subsoil of mottled yellow and gray silty clay. The extent of the gray mottling is greater at a distance from the streams, and in places the surface soil is tinged with gray. As mapped the type includes numerous variations in color and texture representing inclusions of the Ochlockonee silty clay loam and fine sandy loam, and the Bibb silty clay loam and silt loam. In the bottoms of creeks tributary to Saline Bayou in the northeastern part of the parish the soil is largely of Ochlockonee silty clay loam.

The type in the smaller bottoms is subject to overflow, but is adequately drained between overflows. Little of it is farmed, but a few typical areas are planted to corn, producing an average of 15 to 30 bushels per acre. However, crops are occasionally lost. Bermuda grass, lespedeza, and native grasses thrive on the type, and it could well be used for pasture.

CATALPA CLAY.

The Catalpa clay is typically a dark-brown silty clay grading at about 8 to 12 inches into dark-brown plastic silty clay or clay with some mottling of dark bluish gray or rusty brown. As it occurs in this parish it has a scattering content of greensand. The soil is not highly calcareous, but shows the characteristic "buckshot" structure of limy soils on drying.

The type occurs in the bottoms of Bryant Creek and Remy Creek, in the northern part of the parish, the material having been washed at least in part from the Sumter soils. It is mostly in forest of oak, beech, and gum, with some honey locust, and cypress near the lake.

Perhaps 10 per cent of the type is in cultivation. It is a very productive soil. In good seasons corn yields up to 50 bushels per acre. Cotton formerly yielded up to a bale per acre, but as the type can not usually be planted early and the weevil damages the late crop, the yields are greatly reduced. The land is difficult to cultivate. When it is dried out sufficiently to plant, rain is needed to sprout the seed. In Marengo County, Ala., alfalfa and Bermuda grass give good yields on this type.

BIBB VERY FINE SANDY LOAM.

The Bibb very fine sandy loam is typically a dark-gray very fine sandy loam passing at about 3 to 5 inches into light-gray very fine sandy loam, and this at about 6 to 8 inches into light-gray very fine sandy loam or fine sandy clay somewhat mottled with yellow or pale yellow. In many places the texture is a fine sandy loam, representing inclusions of the Bibb fine sandy loam, the soils being too intricately mixed to separate in mapping.

The type is extensively developed in the bottoms of the local streams and is the predominant type in the bottoms in the Kisatchie Hills and in very sandy uplands. In the Kisatchie Hills, where it consists largely of material from the gray Lauderdale soils, the

subsoil ranges from a friable fine sandy clay to a fairly heavy fine sandy loam. In places the surface soil is rather dark, but for the most part is little darker than typical.

The wide bottoms of Saline and Black Lake Bayous, which are predominantly of this type, are very low and are subject to protracted overflow, the streams at ordinary stage in winter being only 2 or 3 feet below the banks. The upper limits of Black Lake and Saline Lake were indicated quite arbitrarily, as the bottoms might be regarded as intermittent lakes through much of their extent in the parish. In the higher parts, cow oak, with some overcup oak, post oak, ash, and much sweetgum and black gum form a good growth. Excepting these stream bottoms, much of the type could well be reclaimed by dredging.

Probably half of the type is in forest of beech, slash pine, white oak, sweetgum, ironwood, holly, bay, magnolia, maple, hickory, and other trees. Corn is the principal farm crop. The yields are variable, as planting may be delayed by late floods and in some years the crops are damaged or destroyed. In good years yields of 30 to 40 bushels per acre are obtained. Corn is commonly grown for years in succession, but yields decrease somewhat, and on some farms cowpeas are grown in the corn to enrich the land. Some cotton is grown on the lighter, higher parts of the bottoms yielding up to one-third bale or more per acre. Sugar cane yields well and produces a fair quality of sirup on new land. Carpet grass forms a good sod, and provides good pasturage.

On streams flowing through very sandy uplands the type is of lighter texture. The subsoil is a rather light fine sandy loam, and in places is quite compact in the lower part. Here the timber growth is more largely of pine, and very little of the type is under cultivation.

MILLER VERY FINE SANDY LOAM.

The Miller very fine sandy loam consists of dark brownish red very fine sand, loamy very fine sand, or light very fine sandy loam, or interbedded layers of these varying textures, underlain at about 15 to 25 inches by purplish-red heavier material, ranging from a very fine sandy loam to silty clay. The soil is calcareous and the subsoil is usually highly calcareous, effervescing freely with hydrochloric acid.

The type occurs quite extensively along Cane River and to some extent along other channels in the river bottoms. It occupies positions near or adjoining the stream, in high situations overflowed only at intervals of years. Some situations have not been overflowed since settlement.

The surface slopes gently from the stream, and rows running with the slope insure satisfactory drainage. The underdrainage is good, and the highly calcareous, loamy subsoil conserves a good supply of moisture.

Cotton and corn are the principal crops. As this sandy soil gives the best moisture and tillage conditions for early production cotton is the main crop on this soil on many farms. The plants usually reach a height of 3 or 4 feet without fertilizer. The average yield is about one-third to one-half bale per acre, but under favorable conditions a bale or more per acre may be produced. Corn averages about

15 to 20 bushels and with thorough cultivation these yields may be greatly increased, some farmers making 40 to 60 bushels. It is said that following a crop of peavine hay the soil is more easily kept in good tilth and yields are increased 25 per cent. Patches of cowpeas, sugar cane, sweet potatoes and potatoes, oats, and other minor crops are grown. In the adjoining parish of Rapides cane is grown extensively on this type, with normal yields of 20 tons per acre. Bermuda grass and white clover thrive on this land, and it is also well adapted to alfalfa. Peaches and figs produce well. The crop of early figs may be lost by frost, but later figs fruit abundantly. Nut grass, or coco, and Bermuda grass spread more rapidly on the sandy lands than on the heavier soils. When wet weather prevents cultivation for a time while the crops are coming up, the grass is very troublesome, but later the crops shade these lower growths.

The soil may be broken and cultivated to good depth with ordinary equipment. Commercial fertilizers are not used and they are unnecessary, as the soil is rich in the mineral plant foods, and legumes offer the better source of nitrogen. At this time (1921) the type is valued at $50 to $150 an acre.

MILLER SILT LOAM.

The typical Miller silt loam is a chocolate brownish red mellow silt loam, about 8 to 12 inches deep, underlain by purplish-red silty clay loam to silty clay. The surface soil is calcareous, and the subsoil usually highly calcareous. The texture of the surface soil ranges from a mellow silty loam in higher situations to a silty clay loam on the lower side, where it adjoins the Miller clay. Much of the type is locally referred to as "mixed" land. The variation, however, is not marked by any considerable difference in drainage conditions or in structure.

The type occurs in a number of small areas west of Cane River, and in smaller areas elsewhere in the river bottoms. It usually lies between the sandy front lands and the clay back lands. Its position is fairly high and above the usual stage of overflows.

At least 75 per cent of the type is under cultivation. The soil may be plowed to a good depth with ordinary equipment, and is very fertile. Cotton and corn are the principal crops. Cotton makes a rank growth, in some fields reaching a height of from 4 to 6 feet. Production of a bale or more per acre is possible in favorable seasons, but the average yield is little over one-third bale per acre. The stand is frequently left rather thick, which gives a heavier early crop, but the later crop is damaged by the weevil. The average yield of corn is about 15 to 20 bushels, but with thorough cultivation some farmers obtain twice as much without fertilizer. Cowpeas yield 1 to 2 tons of hay per acre. Bermuda grass and white clover form productive meadows and pastures. The soil is well adapted to alfalfa.

MILLER CLAY.

The typical Miller clay is a purplish-red silty clay, with a tinge of brown in the surface soil, passing at about 10 to 20 inches into brighter purplish red silty clay. Aside from this slight change in color there usually is not much variation in the character of the

material throughout the 3-foot section. In places the surface soil has a dark purplish red color. Small black concretions occur in places in the subsoil.

The soil is calcareous and the subsoil is usually highly calcareous, effervescing freely with hydrochloric acid. The content of lime varies. In places the surface soil is highly calcareous, and in other places neither soil nor subsoil give effervescence with acid, but the soil everywhere shows the characteristic structure of a limy soil. It is slightly plastic when wet, but on drying assumes a desirable structure, breaking into granular "buckshot" particles or aggregates. If plowed when wet, a cloddy condition results when the land dries out quickly, but with the first following rain the clods break down to a desirable structure.

The Miller clay is the most extensive soil of the Red River bottoms in the parish, occupying the greater part of the back lands.

The type is subject to overflow in varying degree. The slope from the water front usually continues for a short distance on the clay, and a strip from 100 to 200 yards in width is ordinarily farmed. On Bayou Pierre and Three League Bayou, the Miller clay in many places occupies the front lands, and a considerable width of the higher land is said to be seldom overflowed. The broader expanses of back lands are nearly flat, but they vary in elevation from place to place, and the residents refer to "islands" in what appears a level expanse. The smaller drainage ways usually extend along the crest of slight swells, the width and elevation of these apparently being in proportion to the size of the channel. A large proportion of the type is considered too low to farm. It is said that nearly everywhere in the Spanish Lake Lowlands two crops are lost out of five. Some of the lands cultivated at present are more or less subject to overflow. The soil does not become boggy when overflowed, and soon after the surface water disappears there is little excess moisture. The permanent water table is well below the 3-foot soil section.

At least 80 per cent of the type is in forest. The growth is varied, including several oak species, hackberry, pecan, ash, elm, sweetgum, locust, and cypress, with some lower growth of yaupon (cassena) and various haws.

Cotton and corn are the principal crops. Cotton makes a very large growth in good seasons and the weevil does more damage than on lighter soils. With favorable weather conditions yields may reach a bale or more, but the average yield is perhaps one-third to one-half bale per acre. With good cultivation and favorable weather corn produces 40 to 60 bushels per acre; in dry seasons the yield is much less. As ordinarily farmed, the yield averages about 15 to 20 bushels. Cowpea hay yields up to 2 tons per acre. Alfalfa does especially well, the yields averaging 3 tons or more per acre. Bermuda grass with associated plants makes good meadows and pastures.

With ordinary equipment the land is usually plowed less than 6 inches deep. With ridge cultivation, this does not give sufficient protection against drought. Some farmers now use tractors and break the land to a greater depth, resulting in largely increased yields. The clay has large absorptive capacity, and the calcareous

clay subsoil permits good upward movement of moisture in dry seasons.

Very little has been done to protect these low lands from overflow by backwater, except for short stretches of levee back of some fields near Derry. The heavy clay, sodded with Bermuda grass, makes strong levees, but the labor of building levees with such material calls for power machinery. There are many considerable areas that could be protected against all normal overflows by banks from 4 to 6 feet in height.

YAHOLA VERY FINE SAND.

The Yahola very fine sand is typically a dark brownish red very fine sand to loamy very fine sand. The subsoil is composed of interbedded layers of purplish-red or salmon-colored very fine sand and loamy very fine sand. Locally some thin layers of heavier material are included. In places the lower subsoil consists of rather open textured fine sand of lighter color than common.

The type is calcareous and rich in the mineral plant foods, and the subsoil is highly calcareous. The soil is not unduly subject to drought, and cotton is said to produce better in the drier seasons.

The type occurs in a few small areas near the banks or "front" of Red and Cane Rivers. It occupies high situations. Some of the type was not overflowed during the 1908 flood, and none of it since that time. The topography is smooth to somewhat hummocky.

Part of the type is forested with cypress, oak, honey locust, and some sycamore and cottonwood, but most of it is in cultivation. Cotton is the principal crop, yielding up to a bale per acre in good seasons without fertilizer. It is said that cotton does not "burn" or shed in dry seasons. Sweet potatoes yield up to 200 bushels per acre. Cowpeas and peanuts produce heavily, and following such crops, corn yields well. Some of this land is held at over $100 an acre.

YAHOLA VERY FINE SANDY LOAM.

The Yahola very fine sandy loam typically consists of a chocolate-brown or reddish chocolate brown loamy very fine sand, grading at about 3 to 8 inches into light purplish red very fine sandy loam. Below about 18 to 24 inches interbedded layers of varying textures occur, ranging from very fine sandy clay to loamy very fine sand or in places very fine sand. In the upper subsoil the heavier materials predominate, while the lower subsoil is predominantly of the lighter textures. The arrangement and thickness of the layers is seldom uniform for any distance, but the heavier material does occur consistently and is usually predominant in at least a foot of the upper subsoil. The soil section averages a lighter texture near the streams. The color of the material is uniformly reddish chocolate brown, the lighter materials being of a lighter shade. The soil is usually calcareous, and below 12 to 24 inches the subsoil is highly calcareous, but in places no effervescence with hydrochloric acid is noted to a depth of 10 inches or more. Available analyses also indicate that the soil is rich in phosphorus and potash.

This is the predominant soil type on the fronts of Red River and nearly all the larger channels of the river bottom. The type usually

occupies a strip about 200 to 300 yards in width adjoining the stream. The surface slopes appreciably away from the stream bank. The run-off is not heavy, as the soil absorbs rainfall readily. By running the cotton rows with the slope, satisfactory drainage is obtained. The run-off from heavy rains carries away appreciable quantities of the very fine sand, spreading it for some distance over the heavier adjoining soils.

An extensive area in the fork of Red River and Cane River is occupied by a light variation of the type. The topography is undulating to nearly flat, with well-defined water ways at intervals of 200 to 300 yards. The material is predominantly very fine sand and loamy very fine sand, but layers of very fine sandy loam and some thin layers of heavier material occur in the surface soil and upper subsoil. This variation is considered as productive as the typical soil.

The Yahola very fine sandy loam occupies high situations. Little of it has been overflowed since 1908, and numerous situations on the larger streams have not been overflowed since settlement.

Practically all the type is in cultivation. Under boll-weevil conditions the sandy bottom lands form the best cotton soils and are commonly used almost continuously for that crop. The plants grow from 3 to 5 feet high, but the growth is not as rank as on the heavier soils. With less moisture and shade the weevils do not multiply so rapidly, and in the drier seasons cotton on this soil is not badly damaged. Average yields range from one-third to one-half bale per acre. On worn fields corn suffers from drought in summer, but where cowpeas are occasionally grown the moisture conditions are good, the supply supporting a heavy growth of corn. The average yield is about 15 bushels per acre. Following one crop of cowpeas the yield is said to be increased 25 per cent. On the better farms 40 to 60 bushels have been produced without fertilizer. Cowpeas yield up to 2 tons of hay per acre. Bermuda grass, with white clover and other legumes, forms good pasture and meadow. Potatoes and garden crops produce very well. A good quality of sugar cane is produced. Alfalfa thrives for a season, making a valuable crop for rotations. The yield for the first cutting averages about a ton per acre; the later yields are not so heavy. One grower reported repeated dying out of the crop during the dry weather of the late summer and fall. Coco, or nut grass, is common, and when wet weather follows planting, it is troublesome in cotton, but is checked later by the shade.

The type may be farmed with light equipment. It is usually broken with turning plows to a depth of 6 or 8 inches. The cotton and corn are planted on ridges. Fertilizers are not used; the use of fertilizers doubtless would not prove profitable, as the soil is naturally rich in the mineral plant food, and the abundant growth of legumes provides a better method of increasing the supply of nitrogen in the soil.

Only in exceptional cases can this land be bought at this time for less than $75 an acre, and some farms are valued at $150 to $200 an acre.

There are included in the type some inextensive areas of lower, relatively recent deposits along the Red River, associated with Riverwash, but built up to a somewhat higher level, so that vegetation has

become established. The low areas, however, are subject to change by the addition of deposits from overflow. The surface of these areas is usually rather hummocky. The tree growth is largely of cottonwood. Little of this low land is cultivated, but it forms good Bermuda-grass pasture.

YAHOLA SILT LOAM.

The Yahola silt loam is a brownish-red silt loam, about 6 to 10 inches in depth, underlain by interbedded layers of soil ranging from purplish-red silty clay loam to salmon-colored loamy very fine sand or very fine sand. The upper subsoil is predominantly of the heavier materials and the lower subsoil is predominantly a loamy fine sand to very fine sand. The soil is usually calcareous, and the subsoil highly calcareous. The condition is variable. In one boring the soil to a depth of 24 inches may not effervesce with hydrochloric acid, while near by even the surface soil effervesces.

The texture of the surface soil is somewhat variable. The type is locally called "mixed" land. There are some inclusions of loam and also of silty clay loam farther back from the stream. Under cultivation all the material works quite easily and uniformly. The proportion of heavier material in the subsoil averages greater farther from the stream.

The Yahola silt loam is developed mainly in a belt to the east of Cane River Lake, occupying positions between the sandy front lands and the clay back lands. It lies fairly high and is seldom overflowed.

The surface slopes faintly from the front, and furrows running with the slope provide sufficient surface drainage, though ditching is advisable. The underdrainage is good, as the water table is well below the surface and the crumby structure of the soil is favorable to the passage of moisture and insures large absorptive capacity. Crops on well-cultivated land endure dry periods very well.

The timber growth consists of hackberry, oak, ash, pecan, red haw, honey locust, and other hardwoods. The principal crops are cotton and corn. Cotton makes a very heavy growth in good seasons, many plants reaching a height of 6 feet.

The deeper variations of the type, that is, with a considerable depth of fairly heavy material, comprising the greater part of it, are apparently similar to the Miller silt loam in adaptation and productiveness. However, a lower moisture-holding capacity and interruption of the upward movement of moisture from below seem to be indicated by the growth of alfalfa, which requires much moisture. One farmer had seeded alfalfa for several years on this type, but the crop had not endured more than one season, thinning and dying out in the heat of late summer. Alfalfa, however, makes a profitable yield as an annual crop. The average yields of other crops are nearly or entirely equal to those on the Miller silt loam.

YAHOLA CLAY.

The Yahola clay is typically a dark brownish red silty clay which passes into purplish-red silty clay and this into brighter purplish red silty clay, which is underlain at various depths, usually at 20 to

30 inches, by dark reddish brown very fine sandy loam, loamy very fine sand, or very fine sand. The soil has a crumbly structure and the subsoil is highly calcareous.

The type occurs extensively along Little River and Old River and in various other places throughout the river bottoms, occupying both front and back lands. On the Little River front the land does not appear to be as high as on sandier fronts. Situations some 200 to 300 yards from the channel are said to be overflowed on an average of three times in 10 years. The immediate front of Little River has not been overflowed since 1908. The back lands on Old River are less subject to flood since Cane River was dammed. The wider, flatter expanses of the type are marked by faint rises and falls and are subject to overflow in varying degree. On the whole, the type apparently averages higher than the Miller clay, and houses are more numerous on this type than on the Miller soil. However, in typical "back" situations crops planted in normal seasons are overflowed at least one year in five.

Without ditching the rainfall is carried away slowly, but the heavy soil does not become soggy, and after the removal of the surface water by run-off and evaporation, moisture conditions in the soil are good.

At least 50 per cent of the type is in forest. The deeper variations are apparently very similar to the Miller clay in adaptation and productiveness of all crops, including alfalfa. Where the sandy subsoil occurs at shallow depths the type is somewhat more subject to drought. Alfalfa lasts only one season on the shallower phases but is persistent where the clay extends to a depth of 2 feet or more.

PORTLAND CLAY.

The Portland clay consists of chocolate-brown or reddish-brown silty clay, plastic when wet, showing some dark bluish gray mottling in places at or near the surface. This is underlain at about 15 to 25 inches by purplish-red to chocolate-brown plastic silty clay somewhat mottled with gray.

The type apparently represents Miller clay, modified by effects of poor drainage conditions under which the soil has existed intermittently for long periods, the brownish and grayish colors apparently being produced by deoxidation of the red clay. The material does not usually effervesce with acid within the 3-foot section, but to some extent the soil has the structure characteristic of the Miller soils. Farmers on the type do not speak of it as appreciably more difficult to farm than the Miller clay; it is plowed at about the same time, and is considered about equally valuable. There is a tendency for the dry surface material to crumble.

The Portland clay occurs mainly in a few areas, in association with areas of Perry clay, on Ross Lake, along Old River southwest of Montrose, Bayou Barbue, and south of Spanish Lake Lowlands. The surface is flat and rainfall is carried away very slowly. Most of the type is often overflowed, so that farming is scarcely practicable.

The heavy soil is not boggy even when overflowed, and between overflows is quite well drained.

The timber growth is varied, including pecan, may haw, hackberry, honey locust, and cypress. Near Montrose the type is higher and farmed to some extent. Cotton and corn are the principal crops. Yields are reported to be similar to those on the Miller clay. No alfalfa was observed on the type. Bermuda grass and white clover form good pastures and meadows, and much of the type could well be used for pasture. The area near the Spanish Lake Lowlands is high and much of it is farmed. The soil, however, is not typical, the dark silty clay being quite loamy from a high content of organic matter and in places grading into Miller clay.

BUXIN CLAY.

The Buxin clay is a purplish-red to reddish-brown silty clay, underlain at variable depths, usually at about 18 to 28 inches, by blue to dark-blue, or mottled bluish-gray and reddish, poorly oxidized, plastic silty clay. This soil ranges in character from that of the Miller clay to that of the Portland clay, while the lower subsoil is similar to that of the Perry series. In places the red material is highly calcareous, but the bluish subsoil does not effervesce with hydrochloric acid.

The Buxin clay occurs mainly along Old and Little Rivers, near Lake Cocodrie, and at various other places through the bottoms, in association with the Perry clay. The type is predominantly flat and low, and so subject to overflow that it is not farmed. However, the soil, like that of the Miller clay, does not become soggy when overflowed, and through the summer is well drained between overflows.

The forest growth consists of numerous varieties of trees, including pecan, hackberry, sweetgum, cypress, prickly ash, may haw, cassena, and locust. Some meadows and pastures of Bermuda grass and white clover in typical locations showed a heavy growth. The type in its present condition is probably best suited for hay and pasture. When protected by levees and drained, the soil will undoubtedly produce good crops of cotton, corn, cowpeas, and clovers. It is possible that alfalfa will not root very deeply on account of the unoxidized condition of the lower subsoil.

The following table gives the results of mechanical analyses of samples of the soil, subsurface, and subsoil of the Buxin clay:

Mechanical analyses of Buxin clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
4322118	Soil, 0 to 2 inches	0.5	0.3	0.2	0.4	0.9	37.0	60.6
4322119	Subsurface, 2 to 20 inches	.1	.7	.4	1.1	1.3	29.8	66.8
4322120	Subsoil, 20 to 36 inches	2.1	1.0	.2	1.3	2.6	21.4	71.2

PERRY CLAY.

The surface soil of the Perry clay is a bluish-gray silty clay, with a little mottling of chocolate brown or yellowish brown, grading into bluish-gray plastic silty clay, slightly mottled with reddish

brown, yellowish brown, or pale yellow. Effervescence with hydrochloric acid is not had within the 3-foot section.

The Perry clay occurs extensively in the bottoms of the branches of Red River approximately as far back as they are affected by deposits from back water of Red River. Probably parts of the type, as mapped at greater distances from the main river bottom, represent a closer approach to soils of the Bibb series. But most of the type under cultivation shows a more or less distinct chocolate-brown shading. The Bibb clay does not show such color. Even where the color is not very marked, occasional pecan, hackberry, and locust trees are seen. These trees are not characteristic of the alluvial soils composed of material of local origin and are seldom found on such soils.

Two miles south of Goldonna, near the foot of the uplands, the type is much like Bibb clay, consisting of bluish-gray silty clay with very little mottling in the 3-foot section. Here sweetgum, slash pine, and maple are the principal trees.

In the Kisatchie bottoms south of Cypress, the soil is a mottled dark bluish gray and yellowish-brown to chocolate-brown silty clay, which passes quickly into bluish-gray plastic silty clay mottled with yellowish brown and in places with a little reddish yellow, and this, in turn, passes into mottled light bluish gray and yellow or pale-yellow sticky plastic silty clay. Backwater from the Red River covers these bottoms as far as Good Hope School. The trees here are hackberry, pecan, red oak, elm, red haw, and cypress.

In the Fish Pond Bottom about 4 miles northeast of Robeline there is a mottled rusty-brown and dark bluish gray silty clay grading at about 3 to 5 inches into mottled yellowish-brown and light bluish gray silty clay containing some small concretions. Usually the bluish gray increases with depth in these bottoms. Post oak, sweetgum, pecan, cypress, hackberry, persimmon (persimmon also is rarely seen in stream bottoms not subject to Red River overflow), some ash, and cassena constitute the growth here. On the slight hummocks the soil is mottled brown, rusty brown, and dark bluish gray and the subsoil is a silty clay mottled bluish gray and reddish yellow or yellowish red or mottled bluish gray and yellow or pale yellowish brown.

The creek bottoms are very low. The areas of Perry clay on Kisatchie Bayou and Bayou Barbue were more or less permanent lakes at the time the country was first settled. Very little of the type is farmed. The timber growth varies from stands of cypress, or red haw, apparently in the lowest situations, to a mixed growth including sweetgum, ash, elm, cow oak, post oak, hackberry, persimmon, pecan, and locust. One open area supported a dense growth of "coffee bean."

Large areas of this soil have been ditched and drained in Lonoke County, Ark., and produce well.

An intermittent-lake phase of the type is developed rather extensively in the southeastern part of the Red River bottoms. The coloring of the soil is apparently due to long-continued submergence and consequent poor oxidation and leaching.

A sample of this soil collected under 6 inches of water in Ross Lake consists of bluish-gray silty clay with a little brownish-red

mottling, extending to a depth of about 24 inches, grading into purplish-red or brownish-red plastic silty clay with some faint bluish mottling, especially in the upper part, and with only a little blue in the lower part, but containing some black specks of a concretionary nature. A near-by boring also covered with 5 or 6 inches of water consisted of bluish-gray, dark-bluish, or ashy-gray silty clay with a little chocolate-brown mottling, passing at about 18 to 20 inches into purplish-red or brownish chocolate red plastic silty clay. In places there is no mottling in the subsoil and in others there is some bluish-gray mottling. Another boring near by showed bluish-gray silty clay about 2 inches deep overlying reddish-brown silty clay mottled with dark bluish gray and having a plastic structure.

These intermittent lakes occur at a distance from the outlet of local streams and occupy the lowest parts of broader basins. Their location is indicated on the soil map by intermittent-lake symbols. The land slopes toward them very gradually, and their outline is indefinite in many places. They are not usually deep, and are forested with hardwoods. At low water in the winter it was possible to wade through Lake Cocodrie and Ross Lake, and it is said that most of them dry out in summer. Fordoche Lake was once drained, and it is reported that the soil was quite productive, but crops were so often lost by heavy rains or backwater that farming was unprofitable.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Perry clay:

Mechanical analyses of Perry clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
4322121	Soil, 0 to 22 inches	0.1	0.2	0.1	0.2	0.3	27.3	72.1
4322122	Subsoil, 22 to 36 inches.	.2	.2	.1	.2	1.0	38.1	60.1

RIVERWASH.

Riverwash includes low-lying recently deposited accumulations of sand, together with considerable silt and clay. It is frequently overflowed, and fresh deposits are laid down at every inundation. The surface slopes gradually to the water. Much of it is covered by normal rises, but the higher parts remain out of water the greater part of the time and in places support a growth of willow or pasture grasses. Changes in the outlines of these areas are of frequent occurrence, owing to the cutting and building up by the stream. The land is used only for pasture.

SUMMARY.

Natchitoches Parish is situated in the northwestern part of Louisiana, in the valley of the Red River. It comprises an area of 1,265 square miles, or 809,600 acres. The uplands, which constitute more than half of the total area, are mainly of rolling or hilly topography. The Kisatchie Hills, in the southern part of the parish, are rugged.

The Red River bottoms comprise extensive areas of high front land along the river and bayous and back lands too low for agricultural use. Extensive areas of high terrace adjoin the river bottom.

The population of the area is 38,602. Natchitoches is the principal town and parish seat.

The river bottoms form the main agricultural district of the parish. Cotton is the principal crop, but sufficient corn and hay is produced for home use. Alfalfa is an important crop and Bermuda grass is the principal pasture grass.

The upland is mainly sparsely settled, with large areas of forest and cut-over lands. General farming is practiced, with cotton as the main money crop. Cattle and hogs are ranged in the forest, and a considerable acreage of corn is grown. Cowpeas, peanuts, and sweet potatoes are crops of some importance. Bermuda grass, carpet grass, and lespedeza form the principal pasture growth.

The area is situated in the Coastal Plains region. The formations are mainly of unconsolidated clays, sandy clays, and sands, but there are some local formations of limestone and greensand marl and some formations of solid noncalcareous rock in the southern part. In this humid climate, a large proportion of the more soluble minerals has been leached from the soils of the uplands and terraces. The soils of the first bottoms of Red River are highly calcareous.

The sandy clay formations give rise to sandy soils with friable sandy clay subsoils. The clay formations give rise to soils with heavy plastic clay subsoils.

Of the first group, the fine sandy loams of the Orangeburg, Ruston, Norfolk, and Kirvin series, and the very fine sandy loam of the Bowie series occur. In the aggregate, these soils cover extensive areas. They have good drainage conditions, are easily tilled, and are quite productive of the ordinary farm crops.

The Caddo very fine sandy loam is a flatwoods type, with imperfect drainage, well adapted to grazing and forestry.

The clay formations give rise to the Lauderdale and Susquehanna soils. They have heavy plastic subsoils, and are deficient in moisture-holding capacity. Much of the Susquehanna and practically all of the Lauderdale soils in the parish have a hilly topography and are best adapted to forestry and grazing.

The sand formations of the parish give rise to the Norfolk fine sand. The topography is hilly and the soil droughty, and best adapted to forestry and grazing.

The limestone and greensand formations give rise to the Natchitoches clay and Sumter clay. The Natchitoches clay is a heavy soil, with plastic clay subsoil, and is not farmed at present. The Sumter clay is a dark-colored calcareous soil, and, though little farmed at present, is well adapted to the production of alfalfa and clover.

The soils of the Red River terraces are classified in three series. The Teller soils have sandy surface soils with friable subsoils, and form productive farm land. The Muskogee soils have plastic, mottled subsoils, and have a low agricultural value, being adapted mainly to grazing and forestry. The Bastrop soils are calcareous and productive, but are inextensive in the parish.

The terrace soils of Coastal Plains material are not extensive. The Kalmia fine sandy loam and the Cahaba fine sandy loam have friable sandy clay subsoils and may be built up into highly productive soils. The Myatt very fine sandy loam is poorly drained.

The soils of the main river bottom are predominantly of the Miller and Yahola series. The Miller soils are purplish-red soils with heavy purplish-red subsoils. They are rich in lime and the mineral plant foods. The lime content gives favorable structure even to the clay type. The Yahola soils are similar to the Miller in all respects except that the lower subsoil is of light texture, with somewhat lower capacity for holding soil moisture, but not unduly subject to drought. The very fine sandy loams and silt loams of these series occupy high front situations and are very productive cotton soils. The clay types occupy lower back lands, but large areas are so seldom overflowed that they form valuable farm lands. The Portland and Buxin clays are not rich in lime, and occupy low situations. They are inherently productive soils. The Perry clay consists of very poorly drained and unoxidized material, derived in part from the Permian Red Beds. The type is subject to frequent and prolonged overflow.

Most of the creek bottoms are occupied by soils of the Ochlockonee series. They are not often overflowed in the later growing season, and in places they are farmed.

The Bibb very fine sandy loam is gray in color and imperfectly drained. Some of it is farmed. The Catalpa clay is calcareous, and is a productive soil. There are some developments of Riverwash along the Red River, but they are not extensive.

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U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF SOILS

SOIL MAP

LOUISIANA
NATCHITOCHES PARISH
NORTHERN SHEET


LEGEND
Bastrop clay B
Muskogee silt loam Mm
Susquehanna fine sandy loam Sf
Bibb very fine sandy loam Bv
Muskogee clay M
Sf Deep phase
Bowie very fine sandy loam Bf
Myatt very fine sandy loam Ml
Sf Gravelly phase
Buxin clay Bc
Natchitoches clay Nc
Susquehanna very fine sandy loam Ss
Caddo very fine sandy loam Cv
Norfolk fine sand Ns
Ss Flat phase
Cahaba fine sand Cs
Norfolk fine sandy loam Nf
Susquehanna clay Sc
Cahaba fine sandy loam Cf
Ochlockonee fine sand Oc
Sc Flat phase
Catalpa clay C
Ochlockonee fine sandy loam Of
Teller fine sand Ts
Kalmia fine sand Ks
Ochlockonee silt loam Om
Teller fine sandy loam Tf
Kalmia fine sandy loam Kl
Orangeburg fine sandy loam Os
Teller very fine sandy loam Tv
Kirvin fine sandy loam Kf
Perry clay P
Tv Imperfectly drained phase
Miller very fine sandy loam Mf
Portland clay Pc
Yahola very fine sand Yf
Miller silt loam Ms
Ruston fine sand Rf
Yahola very fine sandy loam Yv
Miller clay Mc
Ruston fine sandy loam Rs
Yahola silt loam Ys
Muskogee very fine sandy loam Mv
Sumter clay S
Yahola clay Y
Riverwash R
CONVENTIONAL SIGNS
R. 10 W.
R. 9 W.
R. 8 W.
R. 7 W.
R. 6 W.
R. 5 W.
R. 4 W.
T. 13 N.
T. 12 N.
T. 11 N.
T. 10 N.
T. 9 N.
BLACK LAKE
CLEAR LAKE
SALINE LAKE
THE PRAIRIE
SPANISH LAKE LOWLANDS
Bossy Brake
NATCHITOCHES
East Natchitoches
State Normal School
Bethel Church
Oak Grove Church

Soils surveyed by J. A. Kerr, in charge, B. H. Hendrickson,
S. W. Phillips, J. Ambrose Elwell, Louis A. Wolfanger and R. E. Devereux

Scale 1 inch = 1 mile

Field Operations
Bureau of Soils
1921

U.S. DEPARTMENT OF AGRICULTURE
BUREAU OF SOILS

SOIL MAP

LOUISIANA
NATCHITOCHES PARISH
SOUTHERN SHEET

LEGEND

- Bibb very fine sandy loam — Bv
- Bowie very fine sandy loam — Bf
- Buxin clay — Bc
- Caddo very fine sandy loam — Cv
- Cahaba fine sandy loam — Cf
- Catalpa clay — C
- Kalmia fine sand — Ks
- Kalmia fine sandy loam — Kl
- Kirvin fine sandy loam — Kf
- Lauderdale stony fine sandy loam — Ls
- Lauderdale fine sandy loam — Lf
- Lauderdale clay — Lc
- Miller very fine sandy loam — Mf
- Miller silt loam — Ms
- Miller clay — Mc
- Muskogee very fine sandy loam — Mv
- Muskogee clay — M
- Myatt very fine sandy loam — Mi
- Natchitoches clay — Nc
- Norfolk fine sand — Ns
- Norfolk fine sandy loam — Nf
- Ochlockonee fine sand — Oc
- Ochlockonee fine sandy loam — Of
- Ochlockonee silt loam — Om
- Orangeburg fine sandy loam — Og
- Perry clay — P
- Portland clay — Pc
- Ruston fine sand — Rf
- Ruston fine sandy loam — Rs
- Sumter clay — S
- Susquehanna fine sandy loam — Sf
- Susquehanna very fine sandy loam — Sv
- Susquehanna clay — Sc
- Teller fine sand — Ts
- Teller very fine sandy loam — Tv
- Yahola very fine sand — Yf
- Yahola very fine sandy loam — Yv
- Yahola silt loam — Ys
- Yahola clay — Y
- Riverwash — R

Deep phase — Sf
Flat phase — Sv
Flat phase — Sc
Imperfectly drained phase — Tv

CONVENTIONAL SIGNS

CULTURE *(Printed in black)*

City or Village, Roads, Buildings, Wharves, Levee, Breakwater, Lighthouse, Fort
Secondary roads and Trails
Railroads Steam and Electric
Bridges, Ferry
R.R. crossings, Tunnel
Ford, Dam
School or Church Cemeteries
Mine or Quarry Mine dumps Made land
Bluff Escarpment, Rock outcrop and Triangulation station
Sandy and Gravelly areas
Soil boundaries
Boundary lines
Boundary lines
Boundary lines
U.S. township and section lines

RELIEF *(Printed in brown or black)*

Contours Depression contours
Prominent Hills Mountain Peaks
Sand, Wash, and Sand dunes
Shore and Low-water line, Sandbar

DRAINAGE *(Printed in blue)*

Streams
Lakes Ponds Intermittent lakes
Intermittent streams
Springs Canals and Ditches, Flumes
Swamp Salt marshes
Submerged marsh Tidal flats

The above signs are in general use, but slight irregularities from the usage appear in some maps of earlier dates.

Soils surveyed by J. A. Kerr, in charge, B. H. Hendrickson, S. W. Phillips, J. Ambrose Elwell, Louis A. Wolfanger and R. E. Devereux

Scale 1 inch = 1 mile

Field Operations Bureau of Soils 1921